

Sida-SAREC's Support to the International Centre for Theoretical Physics

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**Sida Evaluation 97/8
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Executive summary

Background for the Evaluation. SAREC is an important international donor in the basic sciences (biology, chemistry, mathematics and physics) in Africa, both through bilateral programmes and through its support to ICTP and ISP in Uppsala. SAREC's support to ICTP began in 1976 and was then directed only to the Associate Membership Scheme. After an independent evaluation of SAREC's support to ICTP in 1989, support was also granted to the Office of External Activities, which was however earmarked only for activities in Africa. Support to the two ICTP programmes is considered an important part of SAREC's efforts to strengthen basic sciences in developing countries.

The present report on the SAREC support to the Office of External Activities and the Associate Membership Scheme at the International Centre for Theoretical Physics (ICTP) is the result of an evaluation carried out in August-September 1996. The evaluation team consisted of Dr O. Edqvist and Prof J. S. Nkoma. This is a "top-down" evaluation, as requested limiting its attention to a certain aid programme and tracing its impact over time in different environments. An inbuilt limitation for such a programme evaluation effort is that it does not really allow a comparison of this one programme with the impact of other programmes, nor giving well-founded recommendations to SAREC on appropriate levels of support to ICTP *in relation to other alternatives*. We do include some recommendations on continued support, but these should be read with this background in mind.

It would be useful to do a much broader "bottom-up" evaluation, investigating a number of basic science departments in Africa, and to study the long-term impact of various aid efforts and schemes. We recommend that Sida undertakes such a comparative, extensive study of capacity building in a selection of African science faculties - this would give good ground for a discussion of the impact of different aid schemes, their relative efficiency and how they interact with local efforts.

The African scene. We have throughout this evaluation focused on physics and mathematics at university departments in the least developed countries in Africa. This is because SAREC's support to ICTP is mainly directed to African scientists and university departments and that was the evaluation task at hand. But it also because that is what we know best. Some of what we say about African countries and about physics and mathematics may however be applicable also for other developing countries and other fields of research and higher education.

It is easy to note negative features and problems for higher education and research. Political instability in some countries, a worsening economic situation in the 80's and 90's, disastrous deficits in state budgets, and staggering foreign debts have led to partial breakdowns of the public sector. What was once the pride of the new nation - its university, where the new leaders and the élite should be trained under good circumstances - has become an overcrowded, worn-down, teaching factory. The decreased regular funding of the university system, low salaries and rapidly increasing intake of university students far beyond the capacity of the universities have led to a situation where academic standards are threatened.

However, there are positive features and hopeful signs also. A lot has been achieved. Most African departments of physics and mathematics now have senior indigenous professors

(not expatriates), with long experience and with a realistic sense of what can be done with small means. They are well informed about international science and they strive to uphold good standards both in teaching and in research. There is research and research training going on, though the research volume is small and the work carried out with a minimum of infrastructural support and with outdated equipment.

We believe that the system for higher education in any country must include teaching of science subjects and that a healthy university system should include a certain amount of research in basic sciences for the senior teachers, as well as MSc and PhD training in research for advanced university students. African research in basic sciences is now increasingly directed towards contributions to a knowledge base of relevance for national development - climatology, non-conventional energy, microelectronics, materials science, remote sensing, fibre optics and lasers etc. Research **networks** are being formed, both African and intercontinental, which help in overcoming isolation and resource shortages.

The role of the international community. Great efforts have been made by international donors for the university systems and for basic sciences in Africa over the past decades. Good results have also been achieved. In some cases foreign donors have even built and kept whole faculties running. The task is, however, changed. It is in our opinion not the building up of big structures by major investments which is now called for. It is rather to **meet the national efforts of funding with patient support on a smaller scale**. It is to strengthen local work, to help linking scientists in one African physics department to colleagues in a neighbouring country or in the region, to build regional research networks with active involvement of scientists from the North, to help training young scientists and researchers and to maintain, improve and develop experimental facilities and equipment. The basic virtue in this effort is, we think, **long-term efforts** and patience. The core task is to help **maintaining and renewing the human resource**, the university teachers and the researchers.

This building up of departmental human resources over the long term has been the most important aspect of **the Associate Membership Scheme**. There are strong reasons for continued support to the scheme. Our opinion is that it allows senior scientists from the least developed countries working in basic sciences to continue their research with the support of the excellent library and the good infrastructure of ICTP. They are able to follow courses and training seminars in order to upgrade their scientific competence. Undoubtedly the SAREC funding of the programme has contributed significantly to building research capacity in physics in Africa and in a few countries in Asia.

Assuming unchanged funding levels, Sida should concentrate the support on Africa. The distribution of associates over African countries is uneven. This indicates that there are institutions which have not been aware of the programme and that there are qualified scientists in other countries in Africa who can benefit from the programme.

We propose that the associate period for SAREC associates is extended to six years (as it is for the rest of the associates) in order to better adapt to the needs and limitations of the associates and to increase the flexibility of using the services of ICTP, thereby improving their efficiency.

The Office of External Activities has with support from SAREC during the past six years contributed to building research capacity in Africa through the creation of and support to affiliated centres in seven countries, by establishing five African research networks, by

support to a number of scientific meetings and by granting stay for one expatriate senior researcher at the Affiliated Centre in Cape Coast. The affiliated centres and the networks seem to be sustainable. The element of local funding is considerable and at the same time the activities are not of such a scale that a national government and a university could not continue and build on the basis which has been established. The concept of affiliated centres combines ideas of research being managed by local people according to their own priorities but with a very clear focus, a regional mode of work and networking. The results are good, judging from what we have observed in Dakar, in Cape Coast and in Porto Novo.

We strongly recommend that the Sida support to the Office of External Activities is continued. This will enable more affiliated centres to be formed so that the fields of study can be expanded to include other areas such as electronic instrumentation, materials science, physics of the living state, energy and environment. Continued support will also enable the affiliated centres to undertake, and be the hub for, complementary activities (networks, scientific meetings).

One issue which was raised both in the interviews with associates and during the visits to the Affiliated centres is the importance of fax, e-mail and modern **computer communications**. It is now possible to collaborate in new ways when the costs of communication have drastically decreased. Scientists from developing countries no longer need to be so isolated from colleagues in neighbouring countries, nor even from colleagues on other continents. Through regular communication with friends and colleagues it is possible to cooperate around joint projects, get advice and practical help, etc. We think that it is now possible and justified to invest in computers and computer communications for scientists also in very poor countries. A part of the associate grant should be allowed for setting up improved computer communications.

Finally we recommend that **Sida** should specify conditions and general objectives relating to the support to ICTP more clearly than at present. The objectives should give clear guidance to ICTP on what is expected from the support and how it will be judged. The objectives may specify limitations in geographical terms and fields of sciences, while leaving scope for ICTP to choose suitable ways of carrying out the work in order to attain the objectives.

1. Background

The research branch of the Swedish International Development Cooperation Agency (SAREC) supports research and research training in basic sciences through bilateral, regional and international programmes.

This evaluation report is concerned with SAREC's support to the International Centre for Theoretical Physics (ICTP) during 1989-1996. The support began in 1976/77, then exclusively to ICTP's Associate Membership Scheme (AMS). Starting in 1989/90, SAREC has also been supporting another of the ICTP's programmes, known as the Office of External Activities (OEA), concentrating on the latter's programmes in Africa.

1.1 Universities and basic sciences in Africa

Most research in basic sciences in Africa is carried out in the university departments, even if some work is also done in research institutes, particularly when it comes to applied physics in the areas of environment and energy research. Most African universities were set up in the 1960s as part of the building of independent nations. Great changes have since gone over the continent. It is easy to note the negative features. Political instability in some countries, a worsening economic situation in the 80's and 90's, disastrous deficits in state budgets, and staggering foreign debts have led to partial breakdowns of the public sector. What was once the pride of the new nation - its university, where the new leaders and the élite should be trained under good circumstances - has become an overcrowded, worn-down, teaching factory. The decreased regular funding of the university system, low salaries and rapidly increasing intake of university students far beyond the capacity of the universities have led to a situation where academic standards are threatened and where the best teachers and scientists look for other occupations or even leave the country. The universities now need to redefine their mission and relate it to the changing context.

However, it would in our opinion be a mistake to see only these negative sides of the situation in the African university systems. There are positive features and hopeful signs also, particularly if you look a little closer and choose a long-term perspective. A lot has been achieved. Most African departments of physics now have senior indigenous professors (not expatriates), with long experience and with a realistic sense of what can be done with small means. They are well informed about international science and they strive to uphold good standards both in teaching and in research. There is good research and research training going on, though the research is done more or less in spare time and with a minimum of infrastructural support and outdated equipment. The research is now increasingly directed towards contributions to a knowledge base of relevance for national development - climatology, non-conventional energy, microelectronics, materials science, remote sensing, fibre optics and lasers - just to mention a few areas. Research networks are being formed, both African and intercontinental, which help in overcoming isolation and resource shortages.

1.1.1 Research in basic sciences in Africa: potential and problems

In order to discuss the extent to which SAREC's objectives can be met, it is necessary to understand the magnitude of the problem in terms of what the main problems affecting

research in basic sciences in developing countries are. The situation varies greatly from country to country and from university to university. However, there are common features also.

Most African universities will state that their mission involves three activities: teaching, research, and services to society (including consultancy). In practice teaching is all-dominant, while research work is weak, resulting in low research output. Services to society and consultancy is an area which is yet to be consolidated. The major challenge for African universities in the future is still the teaching of large and growing student numbers, and especially to respond to the social need to train more scientists and engineers.

The basic sciences are normally housed in a Faculty of Science, each of the basic sciences - biology, chemistry, mathematics and physics - forming a separate department. In most of the African universities, teaching has tended to concentrate on undergraduate programmes, and it is only in recent years that teaching at postgraduate level leading to MSc, MPhil or PhD degrees has started. The postgraduate degrees have in some cases been of "sandwich" type, involving some work in Africa, training and work in an institution in the north, and final presentation of the thesis to a university in Africa. It is expected that in future there will be more in-house postgraduate programmes where the whole training will be done locally, but few faculties have yet reached that goal.

As far as research is concerned, there are general problems shared by most of the institutions carrying out research in basic sciences. In our opinion the main problems are the following:

- few scientists with research competence in the basic sciences,
- few technicians with competence to handle scientific equipment, including procurement, installation, maintenance and repair,
- small numbers of students pursuing science subjects,
- serious financial problems in many of the developing countries which affect the possibility of maintaining and improving research capacity,
- lack of scientific equipment,
- problems of spare parts and consumables where equipment is available,
- poorly stocked libraries (subscriptions to scientific journals seem more or less to have ceased during the 80's) and hence inadequate access to scientific papers and books,
- poor information systems and communication,
- poor working conditions and low salaries for academic personnel working in the basic sciences,
- isolation of researchers and lack of research groups,
- low research output in terms of publications in international, regional or local journals,
- few seminars, conferences or workshops,
- weak linkage between research and applications,
- few effective professional scientific societies,

- lack of awareness on the part of political leadership of the role of basic sciences in the development process.

The third area of operation, service and consultancy, needs to be more organised by creating a consultancy policy. Indeed, if universities are to be seen to be relevant, then there is a need to ensure that some service and consultancy is undertaken by university researchers.

To help develop the required research capacity, donor funding should serve as a catalyst. A clear vision will be needed by the national leadership, which should define the future direction of research in the respective universities. There will be a need to determine a judicious balance between pure and applied research, and between choice of research topics, and a need to create sustainable and viable research groups in view of the finite financial resources allocated to research.

1.1.2 Human resource development in basic sciences

Human resource development is a critically important factor in the development of any nation. In this report, we are concerned with human resource development in basic sciences, especially in connection with teaching and research capacity.

Modern development is highly dependent on science-based technologies. Such science-led development should recognise the important role scientists can play. There are several examples of this observation, such as product procurement, product installation, product maintenance and repair, product design and so on.

A close examination of the many types of expertise needed in a nation for dealing with agriculture, food production and processing, soils, textiles, housing, water, energy, environmental protection, telecommunications, pharmaceuticals, electronics products, industrial processes, information technologies, education, health, transport, and other areas, shows the importance of developing human resources in basic sciences. This is necessary for two reasons. First, science-based knowledge is needed for the *identification and tackling of local problems*. Second, an indigenous human resource capacity is necessary for the purpose of *absorbing the necessary new knowledge and skills* from outside and applying these to local, as well as regional and international, problems.

1.1.3 Financing R&D in basic sciences

Research in the basic sciences in Africa is largely carried out in the universities which are normally funded by the governments. However, government resources are overstretched, and hence the contribution to R&D has been small in most African universities, thus leaving researchers to look for donor funding. This situation of funding is not healthy since it makes it difficult to build up sustainable indigenous research groups on important themes.

The contribution of most African countries to R&D is approximately 0.2% of GNP, which is low in comparison to the developed countries by an order of magnitude. In the European Union the average R&D share in 1993 was 2.0 % of GNP (Sweden 3.4 %). The public part of the R&D is of course lower; in Sweden it was 1 %, which then includes defence research. There is a need to convince the political leadership in the African countries that it is necessary to maintain the standards of the higher education system, encourage and support research and build viable university systems, responding to the needs of the societies for well-educated people and professional competence. A vital component of such a strategy is to invest in basic sciences.

There are few international donors and agencies which fund and support basic sciences research but they are very important. The role of these donors has been that of a catalyst. For a long time to come, sustainability of research in basic sciences in Africa will depend on this interplay between donor funding and increased local funding.

1.1.4 Research infrastructure: laboratories, equipment, library and information resources

Research in the basic sciences needs the requisite infrastructure in terms of well-equipped laboratories and libraries with up-to-date journals and books as well as information resources. The state of such facilities varies from one African university to another, but they are generally deficient or non-existent.

Concerning laboratories and equipment, it is important that there is adequate space and stable water and electricity supply. Equipment can be simple or sophisticated, but the basic requirements are similar: efficient procurement, installation, maintenance, good repair and availability of spare parts. The importance of properly trained technicians needs to be emphasized. Further, where there is expensive equipment, mechanisms should be developed to share such an asset with other institutions in the country or even with neighbouring countries at an agreed fee. Some few African universities do have equipment for physics research applications.

A good library is indispensable for good research. However, in most African universities there are only few journals available, and subscriptions are erratic. There is a need for more local funding to libraries, and also the incorporation of modern information systems such as electronic journals on the Internet. A related issue is the nearly total lack of African and national journals in the basic sciences.¹

The use of computers and computer communication networks such as e-mail and the Internet offers a promising future for exchange of information and will have a tremendous impact on performance of research. It is possible to exchange computer files by e-mail, thus reducing the problem of isolation and enabling database searches for information, exchange of data and opinions, access to electronic journals and many other possibilities. African universities should now invest in this new technology which has possibilities which were not available just a few years back.

1.2 Objectives of SAREC

It is important for the evaluation of any programme of support to understand both the objectives of the donor and those of the receiving programme. The relation between a donor and a recipient is a complicated issue where quite often there is a lack of transparency, lack of understanding between the two sides, and sometimes even misunderstandings. It is therefore important for the evaluation work not only to analyze the work of recipient but also to clarify as far as possible what have been the expressed objectives behind

¹ At a continental level, there is the *African Journal of Science and Technology* published by the African Network of Scientific and Technological Institutions, *Afrika Matematika* by the African Mathematical Union, and *Discovery and Innovation* published by the African Academy of Sciences. In addition there are a few national journals.

the donor's support, as well as how these objectives have been communicated to the recipient.

The evaluation covers the period 1989 up to present. In the following we will concentrate on the objectives as they have been spelled out and understood in the period under scrutiny.²

The interpretation of the general Swedish aid objectives for SAREC is spelled out in a set of guidelines from the Government to the agency. SAREC's main task is "to strengthen the research capacity of developing countries and to promote research which may contribute towards a development in accordance with the objectives of Swedish foreign policy." (*SFS 1993:1260*). This has been interpreted by SAREC to mean that SAREC shall assist developing countries in

- building their own research capacity in terms of good research milieus, education of their own researchers, and developing methods for planning and prioritising research, and to allocate resources for this;
- providing financial and scientific resources with the purpose of producing research results within areas of importance for the developing countries, and to transfer to them research results which may be of importance for their development;
- establishing scientific contacts and, when necessary, establishing scientific cooperation with research institutions in Sweden and other countries.

Research capacity is further defined by SAREC as the ability to

- independently identify and define research projects on important development problems;
- plan and implement important research or direct such research which cannot effectively be carried out with domestic technical, financial and human resources;
- assess, select and adapt research results for local adaptation;
- build up and maintain attractive and well-functioning research milieus, inter alia in order to avoid brain drain of researchers;
- participate in and make use of international research; and
- disseminate and implement research results.

1.2.1 The SAREC objectives for the ICTP support

The support to the ICTP programmes should be seen in the context of the SAREC support to basic sciences. This was the framework for the decisions on continued support in 1992, 1993 and 1996. SAREC summarized its policy on basic sciences in 1992 on the basis of

² When the present agreements with ICTP were signed, and decisions made on the direction and volume of the ICTP programmes supported, SAREC was a separate agency. Last year the Swedish aid agencies were merged into a new agency, Sida. The research branch of Sida corresponds closely to SAREC and it is still named so. In the following when SAREC's name is used the context will show if it refers to the earlier agency SAREC or the new research branch of Sida. However, that should not affect the analysis of the objectives which have been guiding the SAREC-supported programmes in the past. The analysis is partly based on O. Stokke, *A Perspective on SAREC's Evaluation System: Policy and Performance*, Stockholm, Juni 1994, SASDA Working Paper Nr 10

three studies.³ This policy work has then been carried further at an international conference sponsored by SAREC and held in Uppsala in 1995.⁴ The conference concluded that a foundation in the basic sciences (understood as biology, chemistry, mathematics and physics) is essential for all research in the applied sciences and for long-term development, that support to development-oriented research in the Third World should include emphasis on the basic sciences, that the support should be geared to solving specific development problems in that country, and that research questions within the basic sciences must be chosen judiciously with the future development needs of the specific country in mind.⁵ The conference documents together with a decision document dated 1992-04-10, *Riktlinjer för stöd till basvetenskaperna*, *Styrelsen 1992:2, punkt 7a*, with the attached memorandum entitled *Draft Policy Document on Support to Research in the Basic Sciences* give a good basis for the policy analysis of the support to basic sciences in general. However, the SAREC Board decisions on the *particular* objectives with the support to ICTP and Secretariat documents preparing the decisions are less clear.

In 1990 the objectives are stated as: "To contribute to

1. decrease of isolation of researchers from developing countries from the international scientific community,
2. increase of the quality of research in developing countries by contact with the research frontiers, and
3. increase of the research competence in developing countries with weak scientific capacity."⁶

On the basis of an evaluation carried out by Prof Banerjee in 1989, SAREC drew the conclusion that objectives 1. and 2. above were satisfied by ICTP, but not objective 3. It was then decided that the support to the Associate Membership Scheme should be limited to the least developed countries, particularly in Africa. Further, the support to specialised courses and workshops in Trieste was stopped and support to External Activities initiated instead.

In 1992 the decision on a continued grant to ICTP was taken together with decisions on support to the International Science Programs, Uppsala (ISP), and the Third World Academy of Sciences, Trieste (TWAS). No particular objectives for ICTP or for the total granting were mentioned in the proposal for the Board decision.⁷ Next year, 1993, a continuation of the support was proposed, this time for three years. The emphasis was then on the International Science Programs, Uppsala, which just had been evaluated.⁸ The importance of concentration on the least developed countries, particularly the African countries, was reiterated. The latest Board decision covered only half a year (1 July-31 December

³ The only published study is: Lennart Hasselgren and Jan S Nilsson, *Reflections on the role of Basic Sciences in Third World Countries*, SAREC Report 1990:1

⁴ *International Conference on Donor Support to Development-Oriented Research in the Basic Sciences*, Uppsala 15-16 June 1995, *Declaration and Recommendations for Action*; together with *Background Documents*.

⁵ *Ibid*, *Declaration*.

⁶ *Styrelsen 1990:3, punkt 7c, Fortsatt stöd till International Centre for Theoretical Physics (ICTP), Trieste*, p 6.

⁷ *Styrelsen 1992:2, punkt 7b, Fortsatt stöd till insatser inom basvetenskaperna genom: ...International Centre for Theoretical Physics (ICTP), Trieste...*

⁸ *Styrelsen 1993:3, punkt 7, Fortsatt stöd till basvetenskaperna*.

1996) and the background document was understandably brief. The short period was the result of a change of fiscal year in Sweden.⁹

The objectives of the support to ICTP have therefore been spelled out in:

- SAREC's general objectives as described above,
- The draft policy document on support to research in the basic sciences of 1992, and
- the specific objectives for the ICTP support, as described in the 1990 decision.

We consider this basis for the support somewhat undeveloped. It is to some extent unclear what has been the driving motivation behind the SAREC support to ICTP and what the conditions for the support actually have been. We have found a certain uneasiness over this in ICTP. We will come back to this later but we will already in this context spell out some issues which we think SAREC should take a stand on. We will also give recommendations in the following relating to these issues.

1.2.2 Issues to deal with in future policy decisions

We think that SAREC should in consultation with ICTP for coming agreement periods work out, and take a decision on the limitations for the support (in order of importance) covering:

- Main objectives of the support
- Relation between immediate objectives of the support and cross-cutting issues like gender, environment and other overriding objectives of Swedish development aid
- Geographical limitations of the support

In addition SAREC may wish to express opinions on particular issues like:

- Topical limitations, if any, in addition to ICTP's own priorities
- Basic requirements on the background of associates
- Policies regarding computerization and computer communications
- Length of stay for associates and associate contractual period
- Specific issues regarding the programmes, like age of associates
- Balance between different components of the programmes
- Reporting requirements

1.3 SAREC's contribution to ICTP

SAREC's support to the Associate Membership Scheme (AMS) and the Office of External Activities (OEA) for the period 1989-1996 amounts to 23 600 000 SEK as summarised in Table 1.

⁹ Sida, Forskningsnämnden 1995/96:5, punkt 6, *Fortsatt stöd till basvetenskaperna*.

Year	Contribution to AMS (SEK)	Contribution to OEA (SEK)	Total (SEK)
1989/90	750 000	1 250 000	2 000 000
1990/91	750 000	1 250 000	2 000 000
1991/92	1 600 000	1 600 000	3 200 000
1992/93	800 000	800 000	1 600 000
1993/94	2 000 000	2 000 000	4 000 000
1994/95	2 100 000	2 100 000	4 200 000
1995/96	2 200 000	2 100 000	4 400 000
1996, autumn	1 100 000	1 100 000	2 200 000
Total	11 300 000	12 300 000	23 600 000

Table 1. SAREC's contribution the two ICTP programmes: the Associate Membership Scheme (AMS) and the Office of External Activities (OEA) for the period 1 July 1989 - 31 December 1996.

It is striking that ICTP has consistently carried over considerable sums to the following financial year. In 1995/96 a sum corresponding to nearly half a year's expenditures was carried over to the second half of 1996. We recommend that Sida adjusts the payment period so that the contributions can be spent during the intended financial year.

1.4 Evaluation of SAREC's support to ICTP

The overall purpose of this evaluation, which covers the period 1989-1996, is to assess how far and in what ways SAREC's support has been utilized by ICTP and to examine the overall approach of ICTP towards assisting in the creation and strengthening of indigenous research capacity in physical and mathematical sciences in developing countries, in particular the least developed countries of Sub-Saharan Africa. The particular questions to be addressed are listed in the terms of reference (Appendix 1).

1.4.1 The evaluation work

The evaluation work comprised the following:

Meeting with representatives for 4 affiliated centres in Lund 12 July, 1996

Discussion with Sida-SAREC officials were held in Stockholm on 22nd August 1996 to be briefed on the evaluation. A visit was also made to *IPPS, Uppsala*.

Visits to three affiliated centres were undertaken by one of the evaluators (J. S. Nkoma) during the period 26th to 31st August 1996. Visits were made to the affiliated centres in Dakar (Senegal), Cape Coast (Ghana) and Porto-Novo (Benin). In each of these affiliated centres, a questionnaire (Appendix 9) was given to the coordinators. The findings of these visits are summarised in the travel report (Appendix 2).

Interviews with associates who were present at ICTP were held during the period 6th September to 12th September 1996. Before the interviews, a questionnaire (Appendix 8) was distributed to them. An interview report is attached (Appendix 4).

Discussions with Professor G Ghirardi and staff of the Office of the Associate Membership Scheme were held during the period 2nd September to 13th September 1996. An analysis

of the reports to SAREC and of material from the AMS office are reported in Appendices 5 and 6. The findings form the basis of the discussion in chapter 3.

Discussions with Professor G Denardo and staff of the Office of External Activities were held during the period 2nd September to 13th September 1996. An analysis of the reports to SAREC and of material from the OEA office are reported in Appendix 7. The findings form the basis of the discussion in chapter 4.

Discussions with the Director of ICTP, Professor M A Virasoro.

The full list of the people interviewed is given in Appendix 3.

1.4.2 Limitations of the study and proposals for the future

As requested in the terms of reference one of the evaluators visited the three affiliated centres in Senegal, Ghana and Benin and interviewed a number of associates and ICTP programme leaders. We have not visited the other affiliated centres and we have not been in touch with any of the beneficiaries of conference grants or the network organizers (but for the LAM network centered in Dakar). However, we would have preferred a much more "Africa-oriented" evaluation. As it is now, we think that we can give clear answers to some questions, but inherent in the programme evaluation approach is a limited perspective, a "frog-in-the-well" point of view. This is a top-down evaluation, limiting its attention to a particular aid project and attempting to trace its impact over time in different environments.

An inbuilt limitation is then that we are not really able to compare this type of support with the impact of other programmes, nor to give well-founded recommendations to SAREC on appropriate levels of support to ICTP *in relation to other alternatives*. We include some recommendations on continued support, but our justification of these recommendations is based on this project-limited approach and should be read with this background in mind.

Our conclusions are based on a limited basis, covering centres in a few countries only (including also personal experiences from Botswana and Tanzania of one of the evaluators). It is also limited only to physics and mathematics. It would be important to make an effort to widen the scope all basic sciences. A broader evaluation should also cover the impact of various international contributions on research and training of researchers in basic sciences.

We recommend therefore that Sida initiates a survey and evaluation of the present state of the basic sciences in Africa and convene a workshop on this basis, complemented with material from earlier reviews and evaluations which can serve as reference points. We would like to see a **broader bottom-up evaluation of capacity building in basic sciences** in Africa. The idea would be to try to trace the impact of the full set of support programmes as seen from the beneficiaries' point of view. Such a study should then make it possible to analyze the long-term impact of the programmes of ICTP as well as the full range of other aid programmes including ISP, IFS, bilateral projects, university collaborations with external support, training schemes etc. A number of science faculties and research institutions in Africa should be studied, and the long-term impact of various aid efforts and schemes investigated and compared. Proposals could then be developed for better utilization and performance of development projects as seen from the beneficiary side - not as seen from the project and donor side. It is our belief that much could be gained from an effort along these lines.

2. The International Centre for Theoretical Physics (ICTP)

2.1 Background

The International Centre for Theoretical Physics (ICTP) is located in Trieste, Italy and is an institute of research in pure and applied physics and mathematics. It was set up in 1964 with Professor Abdus Salam as the Founding Director who led it until 1994. The new director is Professor Miguel Angel Virasoro of Argentinean nationality. The regular budget of ICTP is composed of yearly contributions from the Italian Government, UNESCO, IAEA, and others such as SAREC, governments, international organisations, academies, institutes and other agencies which work for the development of developing countries.

2.2 Objectives and programmes of ICTP

The objectives of ICTP are:

- (a) to help in fostering the growth of advanced studies and research in physical and mathematical sciences, especially in the developing countries;
- (b) to provide an international forum for scientific contacts between scientists from all countries;
- (c) to provide facilities to conduct original research to its visitors, associates and fellows, principally from developing countries.

ICTP implements its aims through the following programmes:

- Research groups and laboratories
- Training courses and scientific meetings
- Diploma courses
- Training and research in Italian laboratories
- External activities
- Associate members
- Federated institutes
- Donations
- Awards

The programmes are run in the following fields of interest:

Fundamental physics: high energy and particle physics, relativity, cosmology and astrophysics, plasma physics and nuclear physics

Physics of condensed matter: solid state physics, atomic and molecular physics, materials science, surfaces and interfaces, liquids, statistical mechanics

Mathematics: applicable mathematics, algebra, geometry, topology, differential equations, analysis, mathematical physics

Physics and energy: non-conventional energy (solar, wind and others), plasma physics and nuclear fusion, nuclear physics and fission

Physics and environment: geophysics, soil physics, climatology and meteorology, physics of the oceans, physics of desertification, physics of atmosphere, troposphere, magnetosphere and aeronomy, remote sensing, mathematical ecology

Physics of the living state: biophysics, medical physics, neurophysics

Applied physics: physics in industry, microelectronics, fibre optics for communications, instrumentation, synchrotron radiation, non-destructive evaluation, lasers, applied superconductivity

Other fields: Digital communications and computer networking

Physics and mathematics teaching

2.3 ICTP facilities: library, computer network and laboratories

ICTP has first-class facilities for research which visiting scientists can use. The library is impressive. It is probably one of the best in the world in its field of interest. It holds 52 000 books, 47 000 journals, 900 subscriptions to journals, and 1 500 theses. Important resources are also 50 000 preprints/reports, 30 microfiche (various journals) and 50 CD-ROMS (optical disks).

The computing facilities at ICTP include a network of computers located across the campus. At the main building there is a cluster of IBM R/6000 580-590 machines that are accessible for large research projects, along with a group of freely usable 486/Pentium PCs and Sun workstations. A similar collection of machines is located at the Informatics Laboratory in the Adriatico Guest House. Another set of interconnected PCs is in the Galileo Guest House.

The ICTP has also a set of training and research laboratories: Atmospheric physics and radiopropagation laboratory, the high-temperature superconductivity laboratory, the laboratory for lasers and optical fibres, and the microprocessor laboratory.

2.4 The Associate Membership Scheme

The Associate Membership Scheme has been designed so as to allow scientists working and living in developing countries to maintain their research capability. There are four categories of associates:

Regular associates are elected by the Scientific Council, and are normally entitled to spend a period of six weeks to 90 days at ICTP, three times in a period of six years. The visits are arranged during periods chosen by the associates themselves, but it is preferable that such visits coincide with times when the centre is organising a research activity relevant to the Associate's research interest.

Senior associates get a provision of US \$ 5 500 which can be spent for visits to ICTP over a six year period. These are former regular associates who have acquired international scientific status and authority in their countries. They are appointed upon recommendation by the Scientific Council.

Honorary associates are appointed as a gesture of appreciation of ICTP. These are former associates who have acquired a position of prestige in their country. This nomination implies no financial commitment by ICTP.

Junior associates are young promising Third World participants in ICTP activities, and come from geographically isolated areas. They are entitled to receive scientific literature up to a total value of US \$ 2 000 during a four year period. They may become candidates for an associate membership.

2.5 The Office of External Activities (OEA)

The objectives of the Office of External Activities (OEA) programmes are:

- (a) to initiate, stimulate or make applicable research and training in the fields of physics and/or mathematics related to locally available resources or local problems of specific relevance to the development of the region.
- (b) to form and strengthen national/regional communities and research groups by supporting institutions or national societies for physicists and mathematicians at all levels.
- (c) to enhance physics and mathematics teaching.

Towards meeting these objectives, the OEA organises the following four programmes: **ICTP affiliated centres, networks, scientific meetings, and visiting scholars and consultants.** These programmes are carried out in the developing countries in Africa, the Middle East, Asia, the Far East, and Latin America.

3. Findings: the Associate Membership Scheme

3.1 Description of SAREC's support to the Associate Membership Scheme

The Associate Membership Scheme allows scientists of a good research level, living and working in a Third World country, to remain in regular contact with ICTP and thus with the international scientific community, to participate in courses in their field and receive training, and, not least, to use the ICTP library. The associates are senior scientists in their countries, expected to do research and to teach new generations and support colleagues at their institutions. The Scheme was initiated in 1964, and is thus one of the oldest programmes of the centre.

There are four categories of associates, as was described in section 2.4, of which only the regular associates are supported by SAREC. They are entitled to spend from 42 to 90 days at the ICTP three times over a period of six years, generally at a time of their own choosing. ICTP provides their fare and a living allowance, while the home institution is expected to grant paid leave of absence. The SAREC-supported regular associates are to be selected mainly from the least developed countries, in particular African countries, and are only allowed to spend their visits during a three-year period. The average number of regular associate members is 440 per year. The number of associates per continent and per subject field for the period is given in Appendix 5.

The total amount of support from SAREC over the period 1989/90-95/96 is 11.3 million SEK (Table 1). The average number of SAREC associates during the eight years 1989-1996 is 100, increasing to 147 associates annually on average during the last four years (1993-1996); see table 2 below. The aggregated number of associates during the last three years is 181. A list of these associates and the accounted costs is included in Appendix 6.

The share of associates supported by SAREC is given in the table 2 below:

Year	Total no. of associates	SAREC-sponsored associates	
	Number	Number	Percentage
1989	409	52	13 %
1990	432	27	6 %
1991	457	32	7 %
1992	441	100	23 %
1993	435	170	39 %
1994	428	131	31 %
1995	471	146	31 %
1996	464	139	30 %

Table 2. Number of SAREC-sponsored associates in comparison with the total number of associates during the period 1989-1996.

The SAREC share of the Associate Membership Scheme has thus increased during the last years and SAREC now funds around 30 % of the ICTP associates. This is a substantial

contribution to the programme and, as the SAREC support is mainly limited to the least developed countries and Africa, it has a clear impact on a programme both in volume and in directing the work towards scientists from low-income countries.

3.1.1 Country of origin of the associates

Africa

We have made a more detailed analysis of the associates supported by SAREC during the last three years 1993/94-95/96. In total, associates from 31 countries have been supported. Most of the support has been directed to African countries (83 %) and a smaller share to Asia (16 %). In addition there are three associates from Peru (receiving 1 % of the total). The median of the total grant amount per country is US \$ 15 500. The total grant amount per country with SAREC funding is given in Figure 1 below.

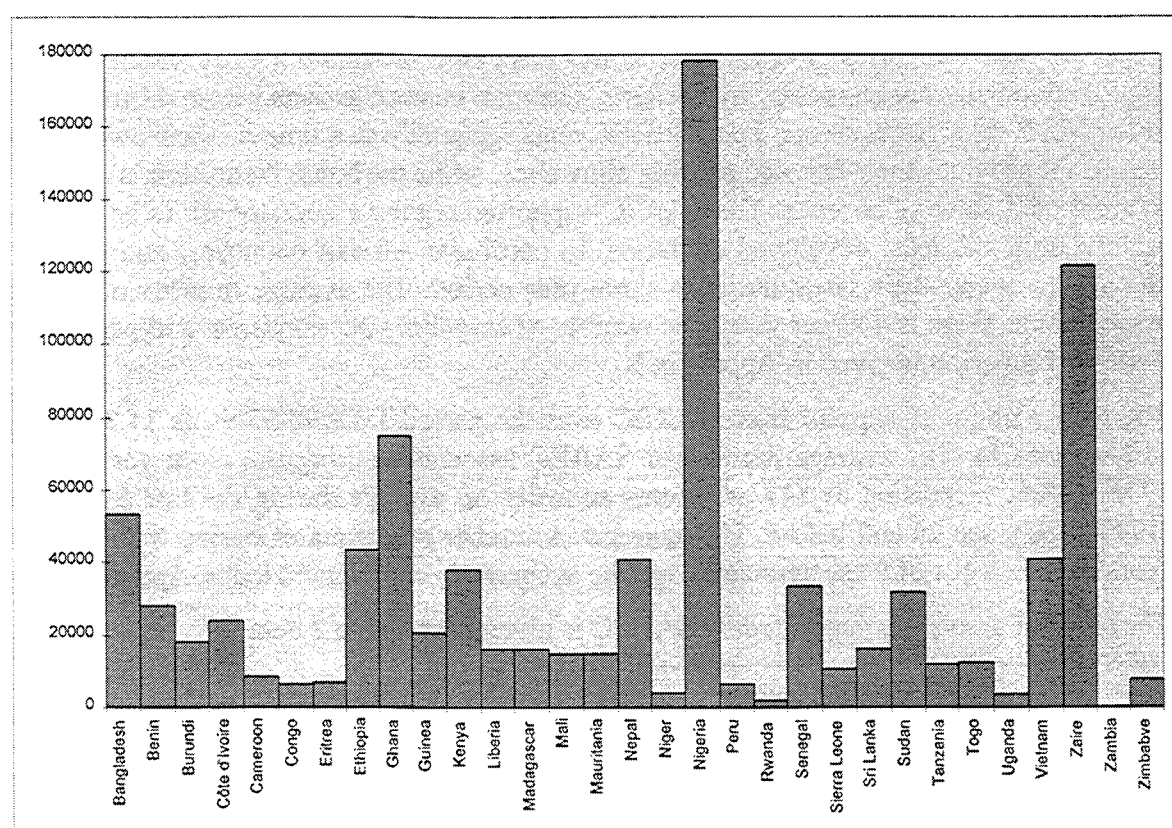


Figure 1. The total expenditures for SAREC-supported associates per country during 1993/94-95/96

The associates come from 31 countries, of which 26 are African. The largest share has gone to 30 Nigerian associates, which have benefited from a total grant of US \$ 178 000 or 24 % of the support to African countries. The African country with the next highest accounted cost during this period is Zaire, with the total contribution of US \$ 122 000 or 16 % of the African total. Associates from West Africa countries (Nigeria, Zaire, Ghana, Senegal, Benin, Côte d'Ivoire, Guinea, Liberia, Mali, Mauritania, Togo, Sierra Leone, Cameroon and Congo) have received US \$ 570 095 or 76 %. Associates from East and Central Africa countries have only received 23 % of the granting volume and Southern Africa, represented by Zimbabwe and Zambia, has only four, recently appointed, associates who up to now have received US \$ 8 200 or about 1 % of the total.

There is thus a very uneven distribution of the associateship programme in Africa, which only partly can be explained by the scientific (and demographic) strength of Nigeria. It seems that ICTP has not been able to reach Eastern, Central and Southern African countries and that information about the Associate Membership Scheme opportunity is not well spread in Africa.

That the number of associates from Nigeria is high is scarcely surprising, given the number of universities and physics departments in that country. However, the grant volume going to associates from Zaire seems to be unexpectedly high in relation to other African countries of similar size. One general conclusion from the observation of the uneven distribution of associateships in Africa, which scarcely can be explained by the availability of individuals with required qualifications, is that there seems to be scope for an expansion of the activities in some parts of Africa. We propose therefore that ICTP should make more active efforts to spread knowledge of the associateship programme in the whole of sub-Saharan Africa.

In particular, SAREC and ICTP should investigate carefully the role South Africa can play in the scientific development of Southern Africa. Perhaps such a positive role could be enhanced if the Associate Membership Scheme were extended to South Africa (not necessarily with SAREC funding).

Asia

The SAREC-supported Asian associates come from only four countries: Bangladesh (35 % of the Asian grant volume and 19 associates), Vietnam (27 % and 17 associates), Nepal (27 % and 8 associates) and Sri Lanka (11 % and 6 associates).

Latin America

The only Latin American country where SAREC funds have been used to support associates is Peru. The presence of Peru in the list of supported countries is puzzling: it is the only country which belongs to the category of middle-income countries and it thus falls outside the limitations for the use of the SAREC contributions.

3.1.2 Scientific field and institutional background

The associates are well spread over the various fields of physics as can be seen from Table 3 below. The great majority of the associates work in university departments, either in a department of physics or of mathematics. Quite a number, however, come from research institutes, situated in and funded by academies of science, national research councils or similar public bodies.

The technological fields associated with microelectronics, communications, digital communications and computer networking have a somewhat different character from the other fields, where physics and mathematics are central. The computer field is obviously of great importance for developing countries. However, engineering work raises problems for ICTP as the associates are partly recruited from organisations outside the normal range of ICTP contacts. Among the associates there are a few who work in telecommunications companies, like Onatel in Burundi, Sonatel in Senegal, and the Radio Broadcasting Service in Nepal. They have probably been selected on the basis of their competence in telematics and computer networking. We doubt that the Associate Membership Scheme can successfully

reach such institutions and companies and make a competent selection of the associates, as one cannot expect the normal type of scientific output from the associates in form of publications etc. in such engineering work within enterprises. We propose that the choice of associates for computing and networking training should be limited to the academic world, such as teachers and engineers at the polytechnics and engineering departments of the universities, where ICTP has good competence.

Field	Number	Amount \$	Share
Physics and environment	30	184 241	20 %
Mathematics	39	176 654	19 %
Physics of condensed matter	44	154 875	17 %
Applied physics	19	134 436	15 %
Physics of high and intermediate energies	18	101 112	11 %
Physics of the living state	16	79 555	9 %
Physics and energy	15	77 343	9 %
Total	181	908 216	100 %

Table 3. Number of SAREC-sponsored associates and total amount in US \$ during the period 1993/94-1995/96 for the different fields of physics and mathematics.

ICTP has over the past years spread its commitments far out from its original concentration on theoretical physics. We think that there are good reasons for ICTP to limit its activity to its present subject boundaries and concentrate on research clearly related to physics and mathematics, including of course the application areas important for development such as environment, materials, energy, the living state and computer technology. However, in our opinion SAREC should avoid specifying exactly what branch of physics or mathematics should receive support, but let ICTP decide on this within the general framework of the Associate Membership Scheme.

3.1.3 Scientific qualifications

The associates are given opportunities to stay and work at ICTP and its facilities at Trieste. The Centre has a first-class library which is invaluable for finding references etc. when scientific papers are being completed. It has excellent computer facilities. There are also training laboratories and other facilities for course work and workshops. It is thus well suited for supporting scientists with a good background and enabling them to upgrade their knowledge, be trained in new fields and continue work on their publications.

In order to utilize an ICTP visit well, the associate should have a strong scientific background. Of the 20 associates whom we interviewed 3 had only a MSc (or corresponding degree) which scarcely allowed them to draw full benefits from the stay. It is our opinion that only applicants with a PhD degree or corresponding research training and qualifications should be appointed as associates.

For those working in areas of telecommunication technology and computer networking a corresponding background in the technology area is required to make full use of the grant. One difficulty here is that there is no established peer review system for judging engineering skills. It may therefore be more difficult for ICTP to make a good selection of associates in these fields, particularly as ICTP is not an engineering institution. We propose that

ICTP limits its selection to academically qualified engineers and avoid appointing associates from people employed by companies.

3.1.4 Age, gender and competence

The age distribution of the present SAREC associates has been investigated (Appendix 6). We have collected age information about 135 associates. The youngest associate is 31 years old, the oldest is 57 years and the median age is 44 years. There are no obvious relations between age and nationality nor between age and subject field. Considering the requirements for making good use of the ICTP facilities this is a reasonable age distribution. The Associate Membership Scheme is primarily intended for leading scientists, who naturally in most cases are senior scholars. Below we comment only on the data concerning Africa, as this covers most of the SAREC-funded associates. Corresponding data for the other regions are given in Appendix 5.

Year	Male	Female	Total	Average visit time (days)
1989	52	1	53	63
1990	53	1	54	64
1991	28	1	29	56
1992	37	2	39	59
1993	56	2	58	64
1994	69	3	72	68
1995	81	4	85	69
1996	44	3	47	71
Average	53	2	55	65

Table 4. Numbers and average visiting time per associate in days for associates from Africa visiting ICTP during the years 1989-1996

We observe a very uneven gender distribution among the associates. A tendency to increase the number of female associates is evident, but the number is still low. There are only four women per hundred associates. However, this probably reflects the distribution of qualified physicists in Africa; women may even be overrepresented in relation to the gender distribution of eligible physicists in Africa. We have not been able to obtain any data which could verify this. It is important that ICTP continues to actively promote women associates and in different ways facilitate women's participation in the programme.

The associates are an important intellectual resource. The national authorities should use their scientists in much better ways than at present. They may contribute not only in research and teaching within their own specialities but also with other services to their societies of a more general nature, using their broad training, their knowledge about the international situation, and their intellectual capacity. This can be done by serving on boards, by participating in public reviews, evaluations and studies, and by working as consultants. The international agencies, the donor organisations and other governmental or non-governmental or private organisations may also draw on their expertise.

In order to further the use of the ICTP associates, we propose that ICTP publishes a regularly updated list of regular and senior associates with information about position, scientific

output and other relevant information and make it available to concerned ministries, international agencies, donors, and other authorities which may use the expertise of the associates in various undertakings, including consultancy, surveys, evaluations etc.

3.2 Effects of the support

3.2.1 Scientific output

The number of internal reports (working papers) normally produced during the stay at ICTP and ICTP preprints written by African associates is given below. ICTP preprints are refereed by scientists in the field and can be considered having the same quality as papers published in international scientific journals. Normally the preprints are also later sent to a journal and accepted for publication.

Year	Internal reports	ICTP preprints
1989	16	16
1990	18	13
1991	8	4
1992	6	13
1993	11	9
1994	11	10
1995	9	24
1996	3	6
Average	10	12

Table 5. Numbers of ICTP Internal Reports and preprints produced by associates from Africa for the period 1989-1996

We consider this output of refereed scientific articles low. Over the years only one out of five associates has produced an ICTP preprint during his visit (possibly even less, assuming that some may have made two). Over the total associate period of three visits only one preprint is produced per two associates in average. Even considering that ICTP also has a certain number of associates who work in computing and telematics, where one can clearly not expect publications, the preprint number is low.

However, it is probable that the associates have not used the opportunity to publish ICTP preprints and instead have sent papers directly to the international journals. ICTP has the information (even if it is not complete) but the office has not yet had the resources and time to put it into the database of associates. We could only collect data on the grantees we interviewed within the time given for the evaluation. The 19 associates whom we interviewed reported 69 publications published or submitted for publication to international journals since 1990, i.e. on average 8 publications per associate. There are no reasons to assume that the selection was not representative.

The ICTP preprints and the internal reports may be seen as an addition to what would otherwise have been published. However, the addition is not substantial and the conclusion which can be drawn on the basis of the information we have been able to obtain is that the ICTP contribution to increased scientific output in terms of publications in internationally refereed journals is limited.

We propose that ICTP give increased attention to the publication rates of its associates and give them all possible help and encouragement to publish, both preprints and papers for submission to international journals. ICTP should consider the possibility of establishing some kind of incentives for publication of research (see 5.5.1 below). An updated list of publications of the associates is an evident first step to take.

3.2.2 Stay and work at other institutions

One possibility which ICTP has only used to a very limited extent is to allow the associates one or two stays with a research group of their own choice in other places than Trieste, including institutions in other European countries. This would give greater flexibility for the associates to choose suitable research partners and would make it possible for them to continue to work actively on their research in close cooperation with colleagues. Such a relaxation of the rules and practice of ICTP is clearly desired by the associates which emerged very clearly at our interviews. We recommend that ICTP includes additional forms of support to the associateship scheme. The associates should be allowed possibilities to stay at other research centres in or outside Africa.

Such a change would undoubtedly increase the administrative costs and increase the work for the Associate Membership Scheme secretariat. SAREC should consider allowing ICTP to use a small portion of its contribution for administrative costs involved in such increased efforts within the SAREC area of interest.

3.2.3 Training and courses

The associates usually follow one or several courses or training seminars during their stay. The courses are led by very competent scientists, often among the very best internationally available. The effect of this training is difficult to estimate as it depends above all on the level of the participants. That a well-prepared associate can have very great use of the training and teaching is evident. Most of the associates interviewed give some weight to the courses but they were not mentioned as a first priority. As the funding of the courses is no longer covered by SAREC funding there is no reason to comment further on them in this evaluation.

3.2.4 Institutional effects

The objective for the SAREC support is to raise the research capacity of a country, and more specifically of the institutions of the associates. There is a need to consider the institutional background of the grantee. An associate has of course a much better opportunity to contribute to the scientific research capability of his/her home country if he/she works in a university department which is reasonably well-equipped, has a certain critical size, and teaches a good number of students at the undergraduate level and preferably also at the postgraduate level.

One of the associates we interviewed worked as a teacher of physics in an institution for training of teachers for secondary schools in Lubumbashi, Zaire (Institut Supérieur Pédagogique). It seems that no experimental physics can be done there. In such a case the individual may be served by the Associate Membership Scheme (as he also confirmed) but the contribution of his improved training to his home institution was probably very limited.

We recommend that the associates should normally be academic staff and university employees in order to get the best contributions from the Associate Membership Scheme to building research capacity in poor countries. ICTP must ensure before selecting the associates that the candidates have reasonable institutional facilities, backing and support which enables them to do some research and development work in their home institution (with or without international collaboration). When a decision to accept an application is made it should therefore be important to relate the decision not only to the individual competence of the applicant but also to his/her ability to contribute to the research programme and the situation of the home institution.

3.2.5 Computers, communication, equipment and spare parts

One issue which was raised in most of the interviews and also often brought up during the visits to the Affiliated Centres was the importance of fax, e-mail and modern computer communications. Beside the library it was the computer facilities at ICTP which was seen as important by the associates.

It is now possible to collaborate in new ways when the costs have drastically decreased and the speed of communication has increased. The importance of this is great. Scientists from developing countries no longer need to be so hopelessly isolated from colleagues in neighbouring countries, nor even from colleagues on other continents. Through regular communication with friends and colleagues it is possible to cooperate around joint projects, get advice and practical help etc. Of course, telecommunications can never replace direct contacts and joint experimental laboratory work and field work will of course necessarily involve travelling. However, such travel may be better prepared and the follow-up be made more effective. Telecommunication can also enable scientists in countries with weak libraries to find abstracts and even articles on the Internet. More and more scientific journals make their articles available on the net.

We think that it is now possible and justified to invest in computers and computer communications for scientists also in very poor countries. Associates should be supported with necessary equipment (computers, modems etc.) to make it possible for them to connect themselves to the Internet and get e-mail etc. A part of the associate grant should be reserved for such needs if the associate wants this.

Another problem which was often mentioned at the interviews was the lack of spare parts and maintenance of scientific equipment. ICTP should in our opinion give limited support to help alleviate such problems within the Associate Membership Scheme. We recommend that ICTP allow the associates to set aside part of their grants for some follow-up support for provision of literature, setting up e-mail connections or for provision of minor pieces of research equipment and spare parts.

3.3 Costs and efficiency

The African associates used in 1995/96 US \$ 2 100 for travel and US \$ 4 300 for per diem, a total of US \$ 6 400 per associate and stay (70 days). This is a low cost for the stay and the travel, probably possible due to the effective administration and the long experience of ICTP in organizing the travel and due to low costs for the stay in Trieste. Living costs are low in Trieste in comparison with the Italian average, and certainly considerably lower than in Sweden.

The total costs for the associates are not reported to SAREC as the administrative costs associated with the Programme are not included, nor are the costs for the courses or the laboratories etc. included. Due to the accounting system of ICTP it is only possible to get a clear picture of the direct costs for travel, per diem and other extra costs for the associates within the Associate Membership Scheme programme, while the costs associated with the stay of the associates for administration, for the infrastructure and for the courses, seminars, meetings and laboratories are not accounted on the Associate Membership Scheme. Thus it is not possible to calculate an average total cost per associate from the financial reports and other data available. However, a very rough estimate leads to a cost level for a full three visits of approximately US \$ 20-25 000 per associate.

We lack any firm benchmarks to compare this with. There are to our knowledge no comparative programmes where PhDs are given this type of upgrading and facilities. Compared with a normal joint research project the activity is relatively cheap. A research project stretching out over, say, three years in an African physics department and involving an institution in Sweden costs normally several times more. (The output is then more than training of one single physicist and may include scientific work of Swedish scientists, some equipment in the African institution and perhaps also sandwich training for one or two PhD students.)

The Associate Membership Scheme is run with a high degree of administrative efficiency and low overheads. The uniform features of the associateship scheme give low costs. The associates themselves report good use of the programme in the interviews. Our conclusion is therefore that the efficiency of the Associate Membership Scheme has been good.

3.4 Other observations and recommendations

3.4.1 Associate contract time

The regular associates of ICTP are entitled to spend from 42 to 90 days at ICTP, three times in a period of six years. However, the SAREC-funded associates are granted this within a period of only three years. The agreement on this was made in 1993. The argument for the change was that it should lead to "a more efficient utilization of SAREC funds and at the same time one would have a matching of the period of commitment by ICTP when appointing a new associates...". It seems that SAREC envisaged that ICTP should grant a set of new associates for the period and not replace those granted earlier with new ones (batch operation). However, ICTP has chosen to operate on the basis of assumption of continuous funding and has appointed new associates when old agreements have been phased out (continuous operation). Of course, the commitments towards all associates are (and must be) made conditional on availability of funds for the programme. The idea that the SAREC agreement period should be matched by the same agreement period for the associates has therefore not been realized, if that was the motivation behind the agreement.

The argument that a shorter agreement period should lead to a better utilization of the financial resources should be questioned. From the interviews we held with the associates the majority were in favour of a six-year period and no one was against it (some were grateful for what they got and had not given alternatives much thought). The argument was that the opportunities which an associateship could offer would be better utilized if it could be spread over a longer time-period. The reason is that it is difficult for the associates, normally having a leading role in their department, to be away from the home institutions

for such long periods (40 to 90 days) every year during a three-year period. Teaching loads and other commitments make long visits abroad difficult. Further, some of the associates said that it was difficult to combine teaching, research at home and ICTP visits within such a compressed time limit. Ideally own research should be interspersed with the ICTP stays. If the associate gets time to work on his/her research project at home between the ICTP visits, the time at ICTP can be better used for study, for searches in the library and for finishing scientific papers.

In our opinion these arguments carry weight. It should be possible to satisfy the administrative concerns of SAREC in other ways. We propose therefore that the associate period for SAREC associates is extended to six years in order to adapt to the needs and limitations of the associates and to increase the flexibility of using the services of ICTP as effectively as possible. ICTP may consider a division of the associate agreement into two terms with a mid-term check of scientific publication, benefits for the home institution of the stays, and check of the full use of the offered services, in order to get strong incentives for good utilization of the associateship, good rate of publication and research work (as proposed above in section 5.3.1)

The present average length of stay of the SAREC associates during the last three years has been 70 days, representing a slight increase in the average from around 60 days per visit (see Table 4 above).

3.4.2 Relations between the Associate Membership Scheme and the OEA

There are close relations at the leading level between the Associate Membership Scheme and the OEA. The Director of OEA participates at meetings of the Associate Membership Scheme where selection of associates is discussed and prepared. Candidates from the affiliated centres which fulfil the requirements are normally given priority and granted associateship. Conferences and seminars in Africa supported by OEA are used to spread information about the Associate Membership Scheme.

However, the staff of the two offices are situated in different buildings and seem to have few administrative links (no common database system e.g.). Even the classification systems for scientific fields differ a little.

Our recommendations for a more varied and flexible associateship scheme will no doubt lead to the need for a presence of the Associate Membership Scheme in Africa and expand the area where the two programmes will benefit from each other. We recommend that the administrative and organizational conditions for this are improved.

3.5 Summary recommendation on the Associate Membership Scheme

There are strong reasons for continued operation of the Associate Membership Scheme. We have made a number of observations, some critical, and have given a few proposals for how the programme can be further developed and how its impact for building research capacity can be improved. This said, there is a need to reconfirm that our general impression is that the Associate Membership Scheme is run very well, and that it allows senior scientists from the least developed countries working in basic sciences to continue their research with the support of the excellent conditions and the good infrastructure of ICTP.

There are no doubts on our side that the programme has contributed significantly to building research capacity over long time in physics in Africa and in a few countries in Asia.

Given the present funding level, there are good reasons to concentrate the SAREC funding of the programme to Africa. The distribution of associates over African countries is uneven. This indicates that there are institutions which have not been aware of the programme and that there are qualified scientists in other countries in Africa who can benefit from the programme. We propose therefore that if SAREC continues its support to this programme on the present level, it should be limited to associates from Africa south of the Sahara.

4. Findings: the Office of External Activities

4.1 Activities of the Office of External Activities

As has been described in section 2.5 the Office of External Activities (OEA) runs four programmes: ICTP affiliated centres, networks, scientific meetings and visiting scholars/consultants. There are two major sources of funding for the Office of External Activities: ICTP and SAREC. The expenditures of the OEA during 1989-1996 are shown in Table 6.

	Africa	Middle East	Asia	Far East	Latin America	Total
1989	466 700	90 500	250 400	194 120	409 900	1 411 620
1990	185 000	18 500	133 000	110 500	124 100	571 100
1991	328 500	56 500	217 708	102 300	235 800	940 808
1992	186 000	23 000	134 600	99 500	124 000	567 100
1993	276 350	44 500	105 800	79 850	76 400	582 900
1994	217 100	21 000	117 500	47 500	122 400	525 500
1995	313 590	44 800	87 950	89 450	135 600	671 390
1996	225 400	33 000	98 105	74 500	101 600	532 605
Total	2 198 640	331 800	1 145 063	797 720	1 329 800	5 803 023

Table 6. OEA expenditure (in US \$) during 1989-1996

The total Swedish contribution to OEA during the period is 12.3 million SEK (approximately US \$ 1.8 million at the present exchange rate) as shown in Table 1 in chapter 1. The funds have been used to provide the following in sub-Saharan Africa for the period 1989-1996:

- 5 active affiliated centres
- 5 networks
- 116 scientific meetings (35 were in mathematics, 24 in physics and mathematics education, 21 in applied physics, 15 in environmental physics, 7 miscellaneous, 6 each in theoretical physics and energy, and 1 each in condensed matter physics and physics of the living state)
- 20 visiting scholars/consultants

Very clearly the SAREC contribution through the OEA has been very important for the OEA work. Africa receives the major share of the total OEA funds (38 %) and nearly all of that is financed by SAREC. The SAREC contribution has had a major impact on work in Africa.

4.2 Affiliated Centres

There are 20 affiliated centres organised by the OEA, with 9 in Africa, 2 in the Middle East, 3 in Asia, 4 in the Far East, and 2 in Latin America as shown in Appendix 7. Since SAREC only funds the activities in Africa we will in the following concentrate our interest on the African centres.

Country	Name of affiliated centre	Period	ICTP support	Field
Benin	Institut de Mathématique et des Sciences Physiques (IMSP)	1988 - 1996	US \$ 225 000	Mathematics, Theoretical Physics
Ethiopia	Department of Physics, Addis Ababa University	1995	US \$ 25 000	Experimental and Theoretical Physics
Ivory Coast	Institut de Recherches Mathématiques (IRMA)	1989 - 1993	US \$ 93 000	Mathematics Education
Ghana	Laser and Fibre Optics Centre (LAFOC), Department of Physics, University of Cape Coast	1992 - 1996	US \$ 135 000	Laser and Fibre Optics
Morocco	Laboratoire de Physique Theorique (LPT), University Mohamed V, Rabat	1989		Theoretical Physics
Senegal	Department of Physics, University Cheikh Anta Diop (UCAD)	1992 - 1996	US \$ 125 000	Laser and Atomic Physics
Sudan	Department of Physics, University of Khartoum	1989 - 1995	US \$ 100 000	Experimental and Theoretical Physics
Tanzania	International Village of Science and Technology (IVST), Arusha	1989		
Zimbabwe	Centre for Computers in Science Education (CISE), University of Zimbabwe	1993 - 1995	US \$ 28 100	Computer Science Education

Table 7. Affiliated centres in Africa

Not all the attempts to establish affiliated centres in Africa have been successful and support to three of them has been interrupted. The conditions for local support and local capability for leading and developing a centre have not always been fulfilled. It is important that the scientific level is upheld and that the activity is sustainable. Only local funding and support and full involvement of good local scholars can lead to good results.

There are now five centres which seem to be stable (Benin, Ghana, Senegal, Sudan and Zimbabwe), while work is under development in Ethiopia. We will limit our comments here to the three which we have visited (see Appendix 2 for more details).

The affiliated centre in Dakar at the Université Cheikh Anta Diop has a team of motivated students under the leadership of Prof A Wague. One PhD has been awarded and there are now 6 PhD students. The number of PhDs is planned to increase. The graduates form the core of a sustainable research team. Comparing to other facilities, it is clear that the laboratory of the affiliated centre is far better equipped. The research output during the period 1990-94 in international journals (43) and conference papers (37) is impressive. Being the headquarters of the African Network on Lasers, Atoms and Molecules (LAM), this affiliated centre is responsible for the future activities in laser, atomic and nuclear physics. The new link involving ICTP, IPPS and Lund is a promising feature of the work and should be enhanced.

Laser and Fibre Optics Centre (LAFOC), the affiliated centre project in Cape Coast, has a research group under the leadership of Dr P K Buah-Bassuah. Their intake of PhD students is regional, with students from Ghana, Liberia, Nigeria, Kenya and Sudan. This is appropriate, if indeed the affiliated centres are to be considered as regional resource centres. The facilities in the laboratory are fully utilised and there are a number of student projects going on. There are now 5 PhDs under training. The department research output in international journals (21) and conference papers (75) is very good. There are other research groups, such as in materials science, solar energy, soils research and atmospheric physics. The X-ray diffraction instrument was not working because of problems of spare parts. The presence of Prof C S Brown

from Bell Labs as a visiting scholar has had a great impact in the affiliated centre and the department as whole. He has evidently, through his engagement which has resulted in several extended visits in recent years, managed to give the centre a real push. The three centres all need to have more qualified technicians who can maintain equipment and computers.

Institut de Mathématique et des Sciences Physiques (IMSP), the affiliated centre in Benin, has a research group that works in the areas of mathematics, mathematical physics and theoretical physics under the leadership of Prof J P Ezin. Their intake of PhD students is regional, mainly from francophone countries. Three PhD degrees have been awarded and 7 PhD students are active now; a very good achievement. This academic year they had many applications (47 in total) but only 5 could be assured sponsorship from the OEA. Staff are committed though they work in difficult conditions. It is planned that IMSP will move to new buildings. It can also be noted that IMSP has been fairly active in organising scientific meetings. IMSP plans to launch a journal, "Communications on Analysis, Geometry and Physics", in January 1997.

It is striking that the centres really work as regional points of strength with intake of PhD students from neighbouring countries. The scientific output of the centres is impressive and actually outstanding for an African research institution (for more details, see the travel report by Prof J S Nkoma, Appendix 2).

SAREC funding has been instrumental in the setting up of these regional centres, working both for the anglophone and francophone countries. The total amount to the now active centres over the past nine years is US \$ 638 100 or on average US \$ 20 000 per active year and centre. We consider this a low cost and far below what is normally needed to run a bilateral research project. The support has been used for fellowships for young PhD students, for provision of equipment and for international contacts. It is encouraging to see what has been achieved for so little money - clearly the ICTP support has acted as a catalyst and has contributed to the mobilisation of university and other local institutional resources. There can be no doubt that the support has been highly cost-efficient.

We conclude that SAREC should continue to support the OEA affiliated centres and that attempts should be made to expand the work to other areas.

4.3 Networks

There are 18 networks supported by the OEA, with 5 in Africa, 1 in the Middle East, 4 in Asia, 1 in the Far East, and 7 in Latin America. Full information is given in Appendix 8. The African networks supported with SAREC funding are shown in Table 4 below.

Of the five networks, one has been phased out (Mathematical Sciences Network for Africa). The other four are active and functioning well. There are very close links between the African Network on Lasers, Atoms and Molecules (LAM) and the affiliated centres in Senegal and Ghana. The same applies for the new network with the IPPS and Lund support. The results from these networks are a number of meetings, published proceedings and, of course personal contacts which greatly enhance the work of PhD students, other researchers and research groups.

Name of Network	1993	1994	1995	1996	Field
Asian African Association for Plasma Training (AAAPT)			US \$ 18 000	US \$ 15 000	Plasma interactions
Bi-regional Network on Tele-communications	US \$ 6 500	US \$ 7 500			Radio propagation
African Network on Lasers, Atoms and Molecules (LAM)			US \$ 20 000		Optics, lasers, optical fibres
Mathematical Sciences Network for Africa	US \$ 10 000				Mathematics
ICTP-IPPS-Lund Cooperation Programme towards affiliated centres in Africa				US \$ 40 000	Optics, lasers

Table 8. OEA-supported networks in Africa

The average cost for each network is about US \$ 15 000 per year. This seems to be a low cost for the activities; very clearly the network meetings alone have cost more money than this. The support is functioning as a catalyst and money seems to be well used. The networks should be seen as a way of building up new activities and continuing to support the work in a region.

4.4 Scientific meetings and visiting scientists

The OEA offers assistance in support of international and regional scientific meetings in the developing countries in the fields of physics and mathematics. Normally the ICTP grant does not exceed US \$ 10 000 and should be matched by local funds. Over the period 1989-1996, 629 scientific meetings have been held with the support of the OEA, with 116 in Africa, 65 in the Middle East, 142 in Asia, 105 in the Far East, and 201 in Latin America as shown in Appendix 7. A detailed list of the meetings in Africa is also given there.

The average support to each meeting is US \$ 6 400. This is much less than what a normal inter-African scientific meeting costs. The reason for the low costs is of course that only the foreign component is reported. The external support is mainly used for travel. As we have no figures for the total costs involved it is not possible to say anything about the cost-efficiency of the activity; it is only possible to state again that the component carried by ICTP seems to have resulted in a great number of activities with a very low amount of external support.

The support to meetings is of course one-off and thus of a different character from the categories above. Most of the activity is wide spread both geographically and over subjects. However, some of the meetings form a continuous chain of events, which contributes to gradually build up an area of work..

4.5 Visiting scholars and consultants

The OEA finally offers support to visiting scholars and consultants in the developing countries in the fields of physics and mathematics. Over the period 1989-1996, 81 visiting Scholars have been deployed with the support of the OEA: 20 in Africa, 4 in the Middle East, 22 in Asia, 13 in the Far East, and 22 in Latin America. A list of the distribution is given in Appendix 7.

Only a few visiting scholars has been supported by the OEA with SAREC funding during the past three years. As has been stated above, some of the grants for visits have had a impact on the work of the centres. The OEA expenditures involved are normally a small part of the total costs, covering mainly the travel costs and per diem.

4.6 Discussion of the results

The concept of affiliated centres aims at building up research capacity in a selected institution, but the centre must have a regional rather than a national focus. The advantage of this approach is that there will be a larger intake of graduate students from the region, sharing of expertise and sharing of scientific equipment and other resources. Such centres can also build networks and organise scientific conferences.

The effects of the OEA activities are:

- In the affiliated centres there have been an increased number of postgraduate students to MSc and PhD level.
- The strengthening of postgraduate education is an indication of the shift from the North to the South as the main centres of such training.
- The affiliated centres have been able to purchase modest research equipment enabling them to carry out experimental work.
- The number of publications in the affiliated centres appears to have increased greatly during the period of ICTP support and is impressive.
- A set of networks have been established. The idea of networking is important.
- The impact of a visiting scholar or a consultants in an affiliated centre is dependent on the person but it seems to have a catalytic effect by involving experienced and engaged scientists the centres.

Most of the activities have received local funding in addition to the external support from OEA, with the exception of the visiting scholars and consultants where ICTP has carried the full costs. It has not been possible for us to establish the total funding picture for all the centres. Some of the local support has also been "in kind" in the form of use of facilities, input of local staff etc. However, on the basis of the information we have and observations from the visits to the affiliated centres, we can confidently state that the research output from the centres and the associated networks has been achieved at a low cost in external support.

The affiliated centres and the networks supported by the OEA seem to be sustainable. The external support is invaluable as an encouragement and as a contribution to cost in foreign currency. However, the element of local funding is considerable and at the same time the activities are not of such a scale that a national government and a university could not continue the support to the activities in the future. OEA should continue to require local funding and support to the institutions appointed affiliated centres.

The activities reflect the fact that very few women are involved in teaching and research in physics and mathematics in Africa. This is not easily changed but the OEA should try to contribute to an improvement. More women should be encouraged to participate in the OEA activities.

The contribution of the support to scientific meetings to building research capacity in Africa is difficult to evaluate. When a series of meetings lead to the formation of a network their value may be very good, but scattered meetings by themselves may leave few lasting traces. The resources used for the meetings can better be used for supporting affiliated centres.

The costs for those visiting scholars which are important for the building up of the centres may be covered by the contributions to the affiliated centres. We think that the OEA should concentrate its work to the affiliated centres and the networks and activities related to them and that the SAREC funding be limited to these aspects of the work.

We strongly recommend that the activities of the OEA be continued and if possible expanded in geographical coverage in sub-Saharan Africa. This will enable more affiliated centres to be formed so that the fields of study can be expanded to include other areas such as materials science, physics of the living state, energy and environment. New affiliated centres in Africa should be chosen so that they contribute to a good spread over scientific fields and towards a more even geographical distribution. Continued support will also enable the OEA to undertake complementary support to networks.

5. Recommendations

5.1 Recommendations on the Associate Membership Scheme

- Sida should continue to support the Associate Membership Scheme. The present level of support seems appropriate considering the changes and limitations proposed below.
- The Sida support should be limited to associates from Africa south of the Sahara.
- Associates should with few exceptions be university employees and must have reasonable institutional facilities, backing and support which enables them to do some research in their home institution (with or without international collaboration). Associates should not be selected from public or private enterprises.
- Associates should have research interests within the present range of research fields. The programme should be focused on physics and mathematics.
- Only applicants with PhD degree or corresponding research training and qualifications should be supported.
- Women should be particularly encouraged to apply for associateship.
- The Associate Membership Scheme should include additional forms of support to the associateship scheme. Stays at other research centres inside or outside Africa should be granted. If desired some follow-up support for provision of literature, setting up e-mail connections or minor pieces of research equipment and spare parts may be included in the support.
- The associate period for Sida associates should be extended to six years in order to better adapt to the needs and limitations of the associates and to increase the flexibility of their use of the services of ICTP.
- Strong incentives should be given for publication of research. The associate agreement may be divided into two terms with a mid-term check of scientific publication and use of the services offered.
- ICTP should publish a list of regular and senior associates with essential information about position, scientific output and other relevant information and make it available to international agencies, donors, concerned ministries and other authorities which may use the expertise of the associates in various undertakings, including consultancy, surveys etc.
- The secretariat of the Associate Membership Scheme may not have capacity to deal with the increased administrative demands arising from the proposals above. Sida should consider allowing a certain overhead cost for running the Associate Membership Scheme.

5.2 Recommendations on the Office of External Activities

- We recommend that the Sida support to activities of the OEA be continued and expanded. This will enable more affiliated centres to be formed so that the fields of study can be expanded to include other areas such as materials science, physics of the living

state, energy and environment. Continued support will also enable the OEA to undertake other complementary activities (networks, scientific meetings).

- The Sida support should as now be limited to activities in Africa south of the Sahara. Supporting links between networks and centres should be built, when appropriate, with research groups in Europe or in South Africa.
- Sida should exclude support to isolated scientific meetings and visiting scholars from its OEA contribution. Support to scientific meetings should be linked to the work of the affiliated centres and the networks and any contribution should be seen as a part of the support to the affiliated centres or the networks.
- Affiliated centres must have good national support in order to be sustainable in the long run.
- Affiliated centres should be located in university departments and must have human resources allowing the centre to achieve a reasonable scientific output and performance over time.
- A more even geographical distribution within Africa of affiliated centres should be sought when setting up new centres.
- Support to the affiliated centres should be long-term with regular reviews and renewal of the agreement, allowing the centres to plan and work with a long-term perspective.
- Women should be particularly encouraged to participate in the scientific work of the affiliated centres.
- Provision of scientific literature necessary for research work and e-mail connections should be essential aspects of the support.
- The network support of the Office of External Activities should be continued when it is linked to the efforts to build up new affiliated centres.
- The establishment of more networks should be encouraged and supported. The networks should be encouraged to work according to the principle of South-South-North (inter-African networks with support and participation of researchers from countries outside the continent).
- Efforts should be made to shift graduate studies and work to the South. Doctoral theses should to the greatest possible extent be defended at the home university.
- Cooperation with TWAS should be strengthened. Sharing of information and joint projects with the International Science Programs, particularly IPPS, have been very fruitful and should be encouraged.
- The capacity of the secretariat of the Office is strained. In order to expand the work as recommended above there is an urgent need to strengthen its capacity. Sida should consider allowing a certain overhead cost for running the Office of External Activities.

5.3 General recommendations to ICTP

- On the basis of the Sida conditions and general objectives with the support to ICTP, the Centre should specify clear operational objectives for the two programmes, the Office of External Activities and the Associate Membership Scheme, and for what

should be achieved by the Sida-supported part of each programme during a defined period. Such objectives may include issues mentioned in the recommendations for the programmes above.

- Practical coordination and exchange of information between the Associate Membership Scheme and the Office of External Activities should be strengthened by closer links at the administrative level.
- ICTP should actively exchange and seek information and advice relevant to its activities with other organisations like the Third World Academy of Sciences, the International Science Programs in Uppsala, the International Foundation for Science, Sida, and other donors supporting basic sciences in Africa.

5.4 General recommendations to Sida

- Sida is recommended to specify conditions and general objectives relating to the support to ICTP more clearly than at present. The objectives should give clear guidance to ICTP on what is expected from the support and how it will be judged. The objectives may specify limitations in geographical terms (e.g. to Sub-Saharan Africa) and fields of sciences, while leaving scope for ICTP to choose suitable ways of carrying out the work in order to attain the objectives.
- Objectives for the ICTP support should be agreed formally between Sida and ICTP and should not be changed during an agreement period unless mutually agreed. Efforts should be made to reach a joint understanding of the tasks and the expectations in the light of the objectives of Sida and the means and limitations of ICTP.
- Sida and ICTP should jointly review the progress of work based on reporting from ICTP. Such a review meeting should be held at agreed times, e. g. annually.
- We propose further that Sida convenes a workshop of representatives of African universities and faculties of science, experienced African physicists, executing agencies (e.g. ICTP, TWAS, ISP, IFS), donors, and other well-informed persons to follow up on recommendations from the International Conference on Donor Support to Development-oriented Research in the Basic Sciences. Such a workshop may discuss in some detail the situation for African physics and mathematics, the past experience of development and problems, the opportunities for future collaboration and external support.
- We recommend that Sida undertakes a comparative, extensive study of methods to build research capacity in a selection of African science faculties and an evaluation of the results of different efforts to support the building and maintaining research capacity in basic sciences in Africa.

6. Lessons learnt

There are four experiences from this evaluation which for us stand out and which we would like to share in this final chapter.

1.

Good research in physics can be done in African universities. Good research standards in physics, mathematics and other basic sciences are important for teaching in sciences, engineering, medicine, agriculture and a number of other subjects. Research in physics is also an important component in multidisciplinary research on important problems in areas like natural resources, energy, environment, engineering, materials research and instrumentation, just to mention a few examples.

Most African departments are struggling with a lack of teachers in relation to student numbers, bad infrastructure, and lack of funds for travel, equipment, spare parts and maintenance. In spite of this, good teaching and some good research is carried out. We have during this evaluation visited a few centres of research which are full of vitality, doing good research reported in international journals, cooperating with colleagues in neighbouring countries and in Europe on the basis of mutual benefit and equal standing.

Seen over a longer time span there has been a slow but steady growth and development of sciences in African universities. Teachers and senior department professors are now nearly all African and no longer expatriates. Standards of research have improved. It has certainly been a slow process with many setbacks and in some cases serious decay can be witnessed, mostly as a consequence of political chaos, civil wars and disastrous deficits in public finances. All the same, our conclusion is that the long-term development of teaching and research in basic sciences in Africa is positive.

2.

Another experience which stands out very clearly from our evaluation is the importance of South-South-North cooperation. With this is meant the building of small research networks involving research groups from two or several developing countries and a research group in Europe. This has been extremely useful and productive in our experience and shows a way ahead. It is part of a transfer of the project responsibilities to the South. It is not easy for a researcher or a research group in Africa to deal competently with collaborators from a rich laboratory in the North, given the extreme inequalities in resources, experience and size. However, in a network this is more easily handled and a fundamental shift in responsibility and ownership of the project can take place.

The same applies for research training. The shift from full research training in Europe to a "sandwich" type of training, with part of the training in the home institution and part of it in Europe, has been of great importance in shifting responsibilities to the South. It is now time to try to shift this emphasis further. Most of the research training should be done in the home country or in neighbouring countries with good resources in the region and the thesis submitted in the home country. We believe that to build up such centres in some countries will be an important task for the coming years. Improved methods of work, better coordination and rethinking of tasks based on the experience of African university leaders in the science faculties will be important.

3.

The third observation which we find important is the increasing importance of computers and computer communication networks. In the last few years the use of e-mail has spread over the world. E-mail makes it possible to communicate and get an answer from a colleague within hours, where it took weeks before. To send a message and an attached file is done in minutes. This enables good and frequent contacts between research groups, sending preprints, drafts of articles, observation data, communicating about daily small problems like troubleshooting of failing equipment etc. What before was impossible because of the time delays and cost is now suddenly within reach. We think that the way forward is to invest in equipment for such communication.

4.

Finally there is the importance of Sida for the development of physics and mathematics in Africa. There are very few donors supporting basic sciences in Africa. This is certainly not the only important thing to do for a development agency; one may argue for concentration on immediately relevant research subjects in, say, the fields of health sciences, agriculture, engineering or environment. However, it is easily overlooked that the fundamental part in all these efforts is to help the African countries to deal with these problems on the basis of their own efforts. The fundamental resource for this is the human capital and its productive use. The basic sciences are an important part of the training of the next generation of researchers, medical professionals and engineers. No national university system can do without science faculties. The importance of SAREC's input over the past years for strengthening the basic sciences has been great. This has been underlined in a number of the meetings and discussions we have held.

Funds and administrative competence are not enough, however. There is a need to involve the international scientific community in the work. This has turned out to be easy when funds and institutional resources are available - many scientists have been ready to put in great personal effort in collaborating with colleagues in developing countries, also in cases where the scientific benefit for the scientist in the advanced country has been remote. However, it is necessary to give such involvement of the international scientific community firm and long-term institutional stability. It is in this respect that ICTP has proved unique and outstanding. Through the sustained funding and support primarily of the Italian Government but also of IAEA and UNESCO - and SAREC - over the years a solid research centre, geared towards the problems and needs of the developing countries, has been built up, with excellent personal resources, an outstanding library and a steady stream of a great number of young, enthusiastic and hard-working visitors from the Third World.

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Abbreviations

AAAPT	Asian African Association for Plasma Training
AGCD	Administration Générale pour la Coopération au Développement
AMS	The Associate Membership Scheme of ICTP
CIMPA	Centre International de Mathématiques Pures et Appliquées
DAAD	Deutscher Akademischer Austausch Dienst
GIRAGA	Groupe Interafricain de Recherche en Analyse, Géométrie et Applications
IAEA	International Atomic Energy Agency
ICAC	Affiliated Centre of ICTP
ICPAM	International Centre for Pure and Applied Mathematics
ICTP	International Centre for Theoretical Physics
IMSP	Institut de Mathématique et des Sciences Physiques
IMU	International Mathematics Union
IPPS	International Program in the Physical Sciences, Uppsala
ISP	International Science Programs
LAFOC	Laser and Fibre Optics Centre
LAM	African Network on Lasers, Atoms and Molecules
OEA	The Office of External Activities of ICTP
SAREC	Swedish Agency for Research Cooperation with Developing Countries
SIDA	Swedish International Development Authority
Sida	Swedish International Development Cooperation Agency
TWAS	Third World Academy of Sciences
UNESCO	United Nations Educational, Scientific and Cultural Organization
ULB	Université Libre de Bruxelles

Appendices

Appendix 1. Terms of reference for the evaluation of Sida's support to the International Centre for Theoretical Physics (ICTP), Trieste

Background

SAREC's two main objectives are:

1. To assist in the creation and strengthening of indigenous research capacity in developing countries, and
2. To support research activities of high relevance to the development of developing countries being carried out in international, regional, Swedish and developing country institutions.

SAREC's support to ICTP, which began in 1976/77, was aimed almost exclusively at assisting the "Associate Membership Scheme". After an independent evaluation of SAREC's support to ICTP in 1989/90, another of the ICTP's programmes, viz. "The Office of External Activities" also received SAREC's support. That was however earmarked for activities only in Africa. Support to ICTP's programmes is considered an important and complementary link in SAREC's efforts for strengthening of Basic Sciences in Developing Countries.

The Associate Programme provides selected numbers of physicists and mathematicians, called Associate Members (AMs) the opportunity of spending 45 to 90 days at ICTP, three times in a period of six years. During their stay at ICTP, the scientists can devote their time either entirely to research or divide it between research and participation in research courses, workshops, seminars and conferences. The numbers of regular associates is currently around 430 per year. About half of them visit ICTP in a year. SAREC is concentrating its support to the programme on AMs from developing countries, primarily from the least developed countries. The visits are made during a period of three years instead of six and a stay at ICTP can be as long as 180 days. The total number of days available to an AM which he can spend at ICTP are still 270. During 1995, SAREC support was available to 158 associates out of a total of 565. During the same year, 233 visits were made by 226 AMs out of which 89 were supported by SAREC funds.

The Office of External Activities is, with support from SAREC, concentrating on providing assistance to Affiliated Centres in Africa (currently in Benin, Ethiopia, Ghana, Ivory Coast, Senegal, Sudan, and Zimbabwe), Network Programme, Visiting Scholars/Consultant Programme and Training Course, Workshops and Conferences. The overall aim of this programme is to encourage institutions in developing countries to initiate local research activities and stimulate exchange of information for improving the quality of education in physics and mathematics.

SAREC's total support to ICTP up to June 1996 amounts to 30 million SEK of which SEK 10.7 million have been allocated for the OEA Programme in Africa. With the expiry of the 1992/93 - 1995/96 agreement in June 1995, Sida has extended its support to ICTP for July-December 1996 by SEK 2.2 million and is currently in the process of considering future support on a three-year basis, 1997-1999.

Terms of Reference

The overall purpose of the evaluation is to assess how far, and in what ways has SAREC's support been utilized in accordance with SAREC's two main objectives stated above. More specifically, the evaluation shall address the following issues pertaining to 1989-1996.

- The overall approach of ICTP towards strengthening of research capacity in physical and mathematical sciences in developing countries, in particular the Least Developed Countries of Sub-Saharan Africa.
- The extent to which ICTP has contributed to building research capacity through the Associate and OEA programmes.
- The significance of Sida's support to these programmes.
- The cost-efficiency of the SAREC-supported programmes in comparison to alternative models for attaining the same goals.

Associate Programme

- The relevance and importance of the choice of Associate Members (AMs) as well as the countries these AMs originate from with respect to SAREC's objectives. The connection between this programme and the OEA in Africa programme.
- The relevance and importance of the fields of research of the associates from the perspective of the general development of the countries the associates come from. The contribution of the stay at Trieste to the development of the institutions that the AMs originate from.
- Assessment of whether the stay of the AMs at Trieste leads to any significant increase in the AM's research output in terms of publications.
- The bearing of Sida's support on the trends and patterns of the choice of associates, countries of origin of AMs and areas of research activities at ICTP in favour of the demands of the resource-poor developing countries.
- On the basis of the findings from the answers to the above questions as well as interviews with the AMs to be conducted in Trieste, the Evaluators shall make recommendations about the Associate Membership Scheme in general and Sida's support to it in particular.

Programme for External Activities in Africa

- Progress of the ICTP affiliated centres in Africa in building indigenous research capacity
- The relevance of the four major activities supported under this programme, viz. The ICTP Affiliated Centres, Visiting Scholars/Consultants, Networks and Scientific Meetings and elaborate on the links between these four activities and on, convergence and divergence of the activities.
- The relevance and impact of the choice of research fields chosen for building capacity at different centres in Africa and their rationale.
- Assessment of optimal number of affiliated centres with respect to the available funds and resources at these centres and ICTP so that resources are not spread too thinly.
- On the basis of the findings from the answers to the above questions as well as visits to at least two centres, the Evaluators shall make recommendations about the OEA programme in general and Sida's support to it in particular.

In addition to the above, the Evaluators are invited to present their own views on what Sida's future policy and strategy should be in its support to the strengthening of research capacity in the physical and mathematical sciences in developing countries through international, regional and national institutions.

Implementation of Evaluation

Two Evaluators will be appointed for the evaluations of which one will be the team leader. They will visit ICTP Trieste and at least two of the ICTP Affiliated Centres in Africa. The Evaluators shall present a draft report to SAREC in English not later than September 30, 1996. The report shall not exceed 45 pages (double spaced) appendices not included. The report shall also be submitted on paper as well as a diskette in WordPerfect for windows, version 5.1 or later. It shall begin with an Executive Summary of maximum 3 pages and close with a section containing the Evaluators' conclusions and recommendations, in particular on SAREC's future support to ICTP. Additional instructions on carrying out the evaluation and preparation of the report are attached in the four enclosures mentioned below and attached.

The draft evaluation report will be sent by Sida to ICTP and others concerned for their comments, which will then be forwarded to the Evaluators by mid-October. The second and final evaluation report shall be submitted by the Evaluators to Sida not later than 30th October 1996.

Enclosures

1. Sida's Evaluation Policy, Department of Evaluation and Internal Audit
2. Sida's Evaluation *Newsletter* - 0/96, Instructions for Evaluations Managers and Consultants.
3. Sida Evaluations Data Worksheet.
4. Sida Evaluation Report - A Standardised Format

Appendix 2. Travel report by J S Nkoma

Introduction

The two main objectives of SAREC are to assist in the creation and strengthening of indigenous research capacity in developing countries and to support research activities of high relevance to their development. Towards achieving these objectives, SAREC gives support to ICTP's Office of External Activities and the Associate Membership Scheme. SAREC has ordered an evaluation of its support to ICTP, and such an evaluation is to include visits to at least two affiliated centres (ICTP Affiliated Centres).

I travelled from Gaborone, Botswana on 21st August 1996 and arrived in Stockholm the following day where I was met by the other evaluator, Dr O Edqvist. A meeting with SIDA officials took place in the morning of 22nd August 1996 at SIDA Headquarters with Dr G Hedebo, Dr A Sher, Dr O Edqvist, Ms A Carlekrantz and Ms Eva-Lotta Pettersson. The afternoon was spent at Uppsala University where Dr Edqvist and myself had discussions with Dr L Hasselgren, Director of International Programme for the Physical Science (IPPS).

Visits were made to Senegal, Ghana and Benin for the purpose of evaluating affiliated centres which are in these countries and supported by SAREC through the Office of External Activities. I left Stockholm on 26th August and was met at Dakar Airport (Senegal) by Prof A Wague, Coordinator of the affiliated centre, University Cheikh Anta Diop (UCAD). The following day, 27th August, was spent visiting laboratories and other facilities at UCAD, and my departure for Accra was on 28th August 1996. Dr P K Buah-Bassuah, Coordinator of the affiliated centre at the University of Cape Coast known as LAFOC (Laser and Fibre Optics Centre), met me at the airport on 28th August and we drove to Cape Coast thereafter. The following day, 29th August, was spent visiting laboratories and other facilities at the University of Cape Coast (UCC), and my departure for Lagos was on 30th August 1996 on the way to Benin. Prof J P Ezin, Coordinator of the affiliated centre in Benin known as Institut de Mathématique et des Sciences Physiques (IMSP) arranged that I be picked up from Lagos and driven to Porto Novo. We had meetings with staff soon after arrival on 30th August and the following day on 31st August before departure for Lagos. I departed Lagos on 31st August and arrived in Trieste on 1st September, where the project work continued and was scheduled to depart Trieste on 15th September 1996 back to Gaborone. These travelling arrangements were efficiently made by Ms A Carlekrantz, International Liaison Officer, Lund University.

Senegal

Senegal is a West African country having borders with the Atlantic Ocean, Mauritania, Mali, Guinea-Bissau, Guinea and the capital is Dakar. It has a total area of 196 190 km² and a population of 8 463 225. Concerning the economy, agriculture accounts for 12% of GDP and provides employment for 80% of the labour force, with about 40% of the land used to grow peanuts; fishing accounts for 23% of foreign exchange earnings; Mining is dominated by extraction of phosphates, but production is falling due to reduced world-wide demand. Tourism is becoming an important economic sector.

The University Cheikh Anta Diop (UCAD) has 25, 000 students which is a large number with 5 Faculties (Science, Medicine, Law, Economics and Polytechnic).

The Affiliated Centre at the Department of Physics, University Cheikh Anta Diop, Dakar

Coordinator: Prof Ahmadou Wague
Year of Establishment: 1992
Address: Department of Physics
Faculty of Science
University Cheikh Anta Diop
Dakar
Senegal
Telephone: +221 24 81 87
Fax: +221 24 63 18
e-mail: wague@endadak.gn.apc.org
Departmental establishment: 32 (Academic staff)
2 (Technical staff)
Number of ICTP associates: 5

The affiliated centre research group

Field: Laser and Atomic Physics
Group members: Prof A Wague (Coordinator)
Dr N A Faye
MSc/MPhil Students
PhD students: 6
Research topics: Atomic and Molecular Spectroscopy
Atomic photoionisation and photoionisation
Laser applications in Agriculture
Laser applications in Environment
Financial resources: ICTP: \$ 125 000 (1992 - 1996)
Local: \$ 10 000 (1992 - 1996)
Other: \$ 2 000 (1992 - 1996)
Major Equipment: Nitrogen Laser
HeNe Laser
Monochromator
PC's
Library: Difficulties in finding up to date journals
Communication facilities: Telephone, fax, e-mail available

	Internet to be connected
Publications:	In International journals: 1990 (9); 1991 (4); 1992 (10); 1993 (14); 1994 (6)
(Whole dept)	In National/Regional journals: None
	Conference papers: 1990 (8); 1991 (3); 1992 (8); 1993 (14); 1994 (4);
Meetings organised:	1991 (1): 1st International Workshop on the Physics and Modern Applications of Lasers
Networks:	South-South: Headquarters of the African Network on Lasers, Atoms and Molecules (LAM)
	North - South: ICTP, IPPS, Lund University
Visiting Scholar/Consultant:	None
Visits by ICTP officials:	1992: Prof Denardo
	1995: Prof Denardo

Remarks

The affiliated centre project in Dakar has a team of motivated students under the leadership of Prof A Wague. The number of PhDs is likely to increase and these graduates are likely to form the core of a sustainable research team. Comparing to other facilities, it is clear that the affiliated centre laboratory is by far the best equipped. The research output in international journals and conference papers is impressive. There is a need for more qualified technicians who can maintain the equipment. There are other research groups, such as in solar energy which take PhD students. Meetings were held with Prof L Diop, Dean of the Faculty of Science and Prof M Kane, Head of the Physics Department. Being the headquarters of the LAM network, this affiliated centre has a responsibility for the future activities in Laser, Atomic and Nuclear Physics. The new link involving ICTP, IPPS and Lund should be enhanced.

SAREC funding has been instrumental in the setting up of the affiliated centre in Dakar in terms of purchase of equipment, holding the LAM network meeting.

Ghana

Ghana is a West African country having borders with the Atlantic Ocean, Togo, Burkina Faso and Cote d'Ivoire and the capital is Accra. It has a total area of 238 540 km² and a population of 17 000 000. The economy is heavily dependent on agriculture (accounts for 50% of GDP) with cocoa being the main cash crop, timber and mining of gold and bauxite.

Ghana has 3 universities (Cape Coast, Legon and Kumasi). The University of Cape Coast has 6000 students and Faculties of Arts, Agriculture, Science, Education and Development Studies.

The Affiliated Centre at the Department of Physics, University of Cape Coast

Coordinator: Dr Paul Buah-Bassuah

Year of Establishment: 1992

Address: Laser and Fibre Optics Centre (LAFOC)
Department of Physics
University of Cape Coast
Cape Coast, Ghana
Telephone: +233 42 33773
Fax: +233 42 32446

Departmental establishment: 11 (Academic staff)
1 (Technical staff)

Number of ICTP associates: 4

The affiliated centre research group

Field: Laser and Fibre Optics
Group members: Dr P K Buah-Bassuah (Coordinator)
Dr S Y Mensah
Mr P K Mensah
Mr P K Obeng

MSc/MPhil Students

PhD students: 5

Research topics: Light Scattering for particle sizing of powdery samples in fluids
Optical fibre sensing
Applied spectroscopy: as applied to materials, agriculture, industry and medicine

Financial resources: ICTP: \$ 125 000 (1992 - 1996)
Local: \$ 40 000 (1992 - 1996)
Other\$ 12 000 (1992 - 1996)

Major Equipment: Nitrogen Laser
HeNe Laser
Semiconductor laser
Monochromator
PC's
High quality lenses and mirrors
Photodetectors

Library: Some journals available - volumes not continuous

Communication facilities: Telephone, fax available. E-mail, Internet to be connected

Publications:	In International journals: 1989 (3); 1990 (1); 1991 (4); 1992
(Whole dept)	? (7); 1993 (4); 1994 (3); 1995 (3); 1996 (4)
	In National/Regional journals: 1993 (4); 1994 (3)
	Conference papers: 1989 (7); 1990 (2); 1991 (3); 1992 (11); 1993 (23); 1994 (14); 1995 (9); 1996 (6)
Meetings organised:	1990 : 4th International Workshop on the Use of Microcomputers in Science and Mathematics Education in Africa
	1994 : 3rd International Workshop on the Physics and Modern Applications of Lasers
Networks:	South-South: Member of the African Network on Lasers, Atoms and Molecules (LAM)
	North - South: ICTP, IPPS, Lund University
Visiting Scholar/Consultant:	Prof C S Brown, Bell Labs, USA
Visits by ICTP officials:	1993: Prof Denardo
	1994: Prof Denardo

Remarks

LAFOC, the affiliated centre project in Cape Coast, has a research group that is committed under the leadership of Dr P K Buah-Bassuah. Their intake of PhD students is regional, with students from Ghana, Liberia, Nigeria, Kenya and Sudan. This is appropriate, if indeed the affiliated centres are to be considered as resource centres. The facilities in the laboratory are fully utilised and I could witness the number of student projects. I was also able to attend a seminar by a PhD student, Mr George Ishiekwe. I also had a meeting with students on a number of issues concerning the development of science teaching and research in Africa. The research output in international journals and conference papers is impressive. There is a need for more qualified technicians who can maintain the equipment. The new link involving ICTP, IPPS and Lund should be enhanced. There are other research groups, such as in materials science, solar energy, soils research and atmospheric physics. The X-ray Diffraction machine was not working because of problems with spare parts.

There was a fruitful departmental meeting, chaired by Prof Head of Physics Department. Meetings were held with Prof A Mensah, Pro-Vice Chancellor, UCC and Prof V P Y Gadzepo, Dean of the Faculty of Science. A meeting with officials of the Ghana Atomic Commission was also arranged.

The presence of Prof C S Brown from Bell Labs as a Visiting Scholar/Consultant has had a tremendous impact in the affiliated centre and the department as whole.

SAREC funding has been instrumental in the setting up of LAFOC in terms of purchase of equipment, holding scientific meetings and partial support of a visiting scholar.

Benin

Benin is a West African country having borders with the Atlantic Ocean, Nigeria, Togo, Burkina Faso, Niger and the capital is Porto-Novo. It has a total area of 112 620 km² and a population of 5 166 735. The economy is heavily dependent on agriculture (which accounts for 35% of GDP

and employs about 60% of the workforce), and the industrial sector only accounts for 15% of GDP and employs only 2 % of the labour force. Natural resources include small offshore oil deposits, limestone, marble and timber.

Benin has only one university with 5 faculties (Agriculture, Economics, Philosophy, Medicine and Science and Technology) as well as a School of Engineering and a School of Administration.

Institut de Mathématiques et des Sciences Physiques (IMSP)

Year of Establishment: 1988

Address: Institut de Mathématiques et des Sciences Physiques (IMSP)
BP 613
Porto-Novo
Republic of Benin
Telephone: +229 22 24 55
Fax: +229 22 36 27
e-mail: imsp@minitel.refer.org

Departmental establishment: 5 (Academic staff)

Number of ICTP associates: 2

The affiliated centre research group

Field: Mathematics and Theoretical Physics

Group members: Prof J P Ezin (Coordinator)

Prof N Hounkonnou

Prof J B Chabi Orou

Prof J Tossa

Prof A N Issa

MSc/MPhil Students 7 (Mathematics and Mathematical physics)

PhD students: 7 (Theoretical Physics)

Research topics:

Riemann Geometry

Mathematical physics

Fluid dynamics

Field theory

Variational calculus

Loops theory

General Relativity

Quantum Field Theory

Statistical Physics

Financial resources:	ICTP: \$ 225 000 (1988 - 1996)
	Local: \$ 16 000 (1988 - 1996)
	TWAS: \$ 10 500 (1995 - 96)
	IMU: \$ 8 000 (1994 - 96)
	AGCD: \$ 51 400 (1994 - 96)
	DAAD: \$ 4 000 (1996)
	ICPAM: \$ 20 000 (1996)
Major Equipment:	Power Macintosh IBM PC's
Library:	Small, 33 journals and 1000 book titles
Communication facilities:	Telephone, fax, e-mail available Internet to be connected
Publications:	In international journals: 1988 - 1996 (14)
(Whole dept)	In national/regional journals: None Conference papers: 1988 - 1996 (11) IMSP plans to launch a journal: "Communications on Analysis, Geometry and Physics" in January 1997.
Meetings organised:	1988 : Seminaire Analyse, Geometrie et Applications 1991 : Workshop on environmental Sciences 1992 : 4th Seminaire GIRAGA 1993 : Conference on Current Research Trends in Mathematics, Computer Science and Mathematical Physics 1994 : Autour des Operateurs de DIRAC 1995 : Méthodes de Résolution des Equations aux Dérivées Partielles de la Physique et de la Géométrie 1996(1) : Conference on Geometric Analysis and Quantum Field Theory 1996(2) : 6th Seminaire GIRAGA
Networks:	South-South: Links with University of Benin (Togo), University of Yaounde (Cameroon), National Mathematics Centre, Abuja (Nigeria), UCAD Dakar (Senegal), University of Kinshasa (Zaire), University of Legon (Ghana) North - South: ICTP, Belgium (UCL, ULB), Germany (Bochum, Leibzig, Stuttgart), CIMPA
Visiting Scholar/Consultant:	None

Visits by ICTP officials: 1992: Prof J O C Ezeilo (on behalf of ICTP)
1995: Prof M K N'jock (On behalf of ICTP)
1996: Prof A Ronveaux (On behalf of TWAS)
1996: Prof C Lobry on behalf of CIMPA-ICTP

Remarks

IMSP, the affiliated centre project in Benin, has a research group that works in the areas of mathematics, mathematical physics and theoretical physics under the leadership of Prof J P Ezin. Their intake of PhD students is regional, mainly from Francophone countries. This academic year they had a great many applications (47 in total) but only 5 were assured sponsorship from ICTP OEA office. Staff are committed though they work in difficult conditions, for example, problems of transport. It is planned that IMSP will move to new buildings. There is a need for more qualified technicians who can maintain the computers.

There were two fruitful departmental meetings, chaired by Prof J P Ezin, Coordinator of IMSP staff, soon after arrival on 30th August and the following day on 31st August before departure for Lagos.

SAREC funding has been instrumental in the setting up of this unique institute which only specialises in postgraduate training and truly serves as a regional centre for the francophone countries. It can also be noted that IMSP has been fairly active in organising scientific meetings. IMSP plans to launch a journal: "Communications on Analysis, Geometry and Physics" in January 1997.

Concluding remarks

My visit to the three affiliated centres in Senegal, Accra and Benin left me with an impression that here was a new concept that is likely to work and hence SAREC funds are certainly well spent. SAREC's major objective is to create indigenous research capacity. Most African universities have been on the continent for well over 30 years now, and not much research capacity has been developed. The concept of an affiliated centre combines ideas of research being managed by local people, a regional character as well as networking, and organisation of conferences. These ideas are likely to work, if one is to go by what happens in Dakar's affiliated centre, LAFOC in Cape Coast and IMSP in Benin.

Appendix 3. List of persons interviewed

Sweden

Dr G Hedebro	SAREC
Dr A Sher	SAREC
Dr L Hasselgren	IPPS, Uppsala University
Ms A Carlekrantz	Lund University

Senegal

Prof A Wague	Coordinator-ICAC, University Cheikh Anta Diop (UCAD)
Prof L Diop	Dean, Faculty of science, UCAD
Prof M Kane	Head, Physics Department
Dr N A B Faye	Senior Lecturer, Physics Department, UCAD
Dr B Diop	PhD Graduate, Physics Department, UCAD
Mr A S Ndao	PhD Student, Physics Department, UCAD
Mr M Biaye	PhD Student, Physics Department, UCAD
Mr A Konte	PhD Student, Physics Department, UCAD
Mr A Ndiaye	PhD Student, Physics Department, UCAD

Ghana

Dr P K Buah-Bassuah	Coordinator-ICAC, University of Cape Coast (UCC)
Prof A Mensah	Pro Vice Chancellor, UCC
Prof V P Y Gadzepo	Dean, Faculty of science, UCC
Prof A Ayensu	Head, Physics Department, UCC
Prof C Brown	ICTP Visiting Scholar/Consultant from USA
Dr S Y Mensah	Senior Lecturer, Physics Department, UCC
Dr H Yakubu	Senior lecturer, Physics Department, UCC
Mr P K Mensah	Lecturer, Physics Department, UCC
Mr G Quainoo	Lecturer, Physics Department, UCC
Mr K Anane-Fenin	Lecturer, Physics Department, UCC
Mr G Ishiekwene	PhD Student, Physics Department, UCC
Ms S Agbodzi	Student, Physics Department, UCC
Ms E Awini	Student, Physics Department, UCC
Mr B Anderson	Student, Physics Department, UCC

Mr E Johnson	Student, Physics Department, UCC
Mr R Okoto	Student, Physics Department, UCC
Mr R K Owusu	Student, Physics Department, UCC
Mr G B Quansah	Student, Physics Department, UCC

Benin

Prof J P Ezin	Coordinator, Institut de Mathématique et des Sciences Physiques (IMSP)
Prof N Hounkonnou	Professor, IMSP, Pro Vice
Prof J B Chabi Orou	Associate Professor, IMSP
Prof J Tossa	Associate Professor, IMSP
Prof A N Issa	Associate Professor, IMSP
Mr L Kotannou	Secretary, IMSP

ICTP

Prof M A Virasoro	Director, ICTP
Prof G Denardo	Head, Office of External Activities
Prof G Ghirardi	Head, Associate Membership Scheme
Mrs O Turra	Head, Associate Office
Prof H Dalafi	Head, Donations Programme
Prof F K A Allotey	Visiting Scientist from Ghana
Prof A O Kuku	Visiting Scientist from Nigeria
C N Awanou	Associate, from Benin
P Mpawenayo	Associate, from Burundi
Y Alemu	Associate, from Ethiopia

Further, 19 SAREC-supported associates have been interviewed, see Appendix 4

Appendix 4. Interview report

Introduction

Interviews with Associate Members who were present at ICTP were held during the period 6th September to 12th September 1996. Before the interviews, the questionnaire shown in Appendix 3 was distributed to them through the office of the AMS through the assistance of Mrs O Turra, Head of the Office of Associate and Federation Schemes.

The responses are summarised in accordance with the questionnaire structure.

Personal Particulars

The distribution of the interviewed associates was as follows: 1 came from Benin, 1 from Burundi, 2 from Ethiopia, 2 from Guinea, 1 from Niger, 7 from Nigeria, 1 from Cameroon, 2 from Senegal, 1 from Sudan and 1 from Zaire.

A majority of the associates interviewed came from physics or mathematics departments of universities. This is as it should be since we believe universities are better placed to provide the necessary institutional backing to create research capacity. The educational qualifications of the interviewees showed that 17 had PhDs and 3 had MSc degrees. It is our opinion that only applicants with a PhD degree or corresponding research training and qualifications should be appointed as associates.

All the associates who were interviewed are male, and this is a reflection of a general imbalance with women being very much underrepresented. Women should be encouraged to apply for associateship.

Human resources

The responses of associates indicated that most of the departments of physics and mathematics in African universities are manned by indigenous academic staff. However, the main problem appears to be the low numbers of qualified people in individual research fields and there was concern on the poor working conditions. A significant number of associates were of the opinion that ICTP has contributed greatly to developing research capacity in Africa.

The situation as far as technical staff was concerned varied from one country to another, but it can generally be said that there is a need to have more qualified technicians who are competent to install, maintain and repair scientific equipment.

Financial resources

The main source of funding for universities in Africa is government, but the contribution to R&D in physics and mathematics is generally low, and researchers are forced to look for donor funding. Significant donors for basic sciences research are SAREC, IPPS, IFS, the Italian Government, ICTP, TWAS, UNESCO, IAEA and a few more. The role of these donors is extremely important and it is conceivable that without these donors the research output would probably be much lower.

Physical resources

Most associates reiterated the problems of lack of scientific equipment and problems of spare parts where equipment is available. There are reported cases of poor installation of equipment and lack of after sales-service. Procurement of equipment is another area of concern.

The libraries are poorly stocked with few books and journals. It is this connection that most associates find the ICTP most useful because of its holdings.

Information resources such as fax, e-mail, internet and the importance of modern computer communications was raised as a major issue by several associates. It is now possible for scientists in developing countries to communicate among themselves and with those from developed countries with great ease. There is a programme whereby associates get abstracts of preprints from ICTP by e-mail.

Some associates working in experimental physics found the laboratories at ICTP very useful. The ICTP has four laboratories: the Atmospheric Physics and Radiopropagation Laboratory, the High-Temperature Superconductivity Laboratory, the Laboratory for Lasers and Optical Fibres and the Microprocessor Laboratory.

Teaching

An observation made by most associates is that they have heavy teaching loads which of necessity leaves little time for research. There was a general tendency for most universities to add postgraduate courses leading to MSc, MPhil or PhD in addition to their undergraduate programme. In some cases, the postgraduate courses are "sandwich" type, involving some work in Africa, exposure to some institution in the north, and final presentation of the thesis to a university in Africa.

Research

The programmes at ICTP are run in the following fields of interest: Fundamental Physics, Condensed Matter Physics, Mathematics, Physics and Energy, Physics and Environment, Physics and the Living State and Applied Physics. Most associates who were interviewed were active in Condensed Matter Physics.

It was observed that very few of the associates were working in research groups in their universities. The impact of ICTP in the publishing of papers in international journals was apparent in the profiles of most associates. Otherwise research papers tended to be published in national journals and conference proceedings. The question of research sustainability was discussed and the idea of the ICACs seemed to be most viable as a way of creating sustainable research groups.

Service and Consultancy

Although most African universities do declare service and consultancy as one of the main duties for their staff, the interviews indicated that only a few universities had clear service and consultancy policy guidelines. There is therefore a need for universities in Africa to draw up clear service and consultancy guidelines.

ICTP should publish a list of African associates and senior associates which provides information such as qualifications, rank, experience, publications and other relevant details. Such a list should be available to international agencies, donors, government ministries and other authorities which may use the expertise of associates as consultants.

Seminars/Conferences/Workshops

An observation of a majority of associates is that there are very few seminars, conferences and workshops for basic sciences taking place in Africa. The impact of the OEA programme of scientific meetings is very significant, for example, during the period 1989-1996, 116 scientific meetings have been held in Africa.

Networking/Cooperating Partners

Networking has been recognised to be a necessary technique of ensuring effective participation in international scientific collaboration. Most associates observed that much as south-south networking is desirable, it is susceptible to problems of funding. North-South networking has been the most common. Apart from these types of networks, a third type of networking, South-South-North, can be very effective, and in this case the South-South collaboration is supported by the North. Examples of this are the OEA Networks such as the African LAM Network, AAAPT, the Bi-regional Network on Telecommunications and the Mathematical Sciences Network for Africa.

ICTP Activities

Associates generally consider that being an Associate Member has had great impact in their research careers. Most of them mentioned that without ICTP it would have been difficult to sustain their research work. What associates found most useful at ICTP include in priority order: Library, computer facilities and seminars, conferences and workshops.

We also put a question to the associates on the issue of whether the associateship should be of three or six years duration. Most associates preferred six years. The main reason was teaching commitments at home and the need for more time to plan what research was to be done at ICTP.

One of the associates, Prof G O Ajayi, from Obafemi Awolowo University at Ile-Ife, Nigeria, summarised his views in the interview questionnaire as follows;

"ICTP has contributed significantly to two research fields: (1) Solid state physics, and (2) Communications physics. Apart from three associates and the Senior associates, five other members of the department have benefited in courses, colleges, and workshops over a period of 25 years!"

Concerning the Office of External Activities, a majority of associates expressed the need to have more ICACs in Africa with a more even geographical distribution and more fields of work. There was also a general observation that the other programmes of OEA (Networks, Scientific meetings and Visiting Scholars/Consultants) need to be increased.

Appendix 5. Data on associates

The Associate Membership Scheme is run for the following **fields of science and technology** (preceded by the abbreviation used in the tables and figures below; see section 4.4 for a full description of the fields):

FP	fundamental physics
PHE	physics of high and intermediate energies
PCM	physics of condensed matter
M	mathematics
PE	physics and energy
PEV	physics and environment
PLS	physics of the living state
AP	applied physics
EDU	education
MIS	miscellaneous

The distribution of the associates over the scientific fields of the total the Associate Membership Scheme was in 1995:

	PHE	PCM	M	PE	PEV	PLS	AP	Total
Africa	19	34	28	26	26	10	18	161
Asia	53	47	37	7	14	15	20	193
Latin America	26	20	28	11	26	10	18	139
Europe	16	8	4	3	5	3	7	46
Oceania		1						1
Total	114	110	97	47	71	38	63	540

Table 1: Number of ICTP regular associates in 1995 for the different scientific fields.

A list of the associates funded by SAREC is given on the next page. It is followed by some statistics for the five regions: Africa, Asia, Latin America, Oceania and Europe are shown in tables below, illustrating numbers and gender distribution, field distribution and the ICTP internal reports and preprints.

AFRICA

YEAR	MALE	FEMALE	TOTAL	Visit time in days
1989	52	1	53	3323
1990	53	1	54	3437
1991	28	1	29	1609
1992	37	2	39	2311
1993	56	2	58	3683
1994	69	3	72	4901
1995	81	4	85	5909
1996	44	3	47	3330

Table 2: Numbers of associates from Africa visiting ICTP during 1989-1996

YEAR	FP	PCM	M	PE	PEV	PLS	AP	TOTAL
1989	17	19	22	23	23	9	3	104
1990	19	26	21	22	22	11	3	116
1991	17	28	24	24	24	10	8	122
1992	16	28	22	26	26	9	7	119
1993	16	34	25	27	27	8	11	134
1994	19	34	26	25	25	9	16	140
1995	19	34	28	26	26	10	18	146
1996	19	30	34	22	22	11	13	138

Table 3: Numbers of associates from Africa and their fields distribution for the period 1989-1996

YEAR	INT REP	ICTP PREP
1989	16	16
1990	18	13
1991	8	4
1992	6	13
1993	11	9
1994	11	10
1995	9	24
1996	3	6

Table 4: Numbers of ICTP Internal Reports and preprints produced by associates from Africa for the period 1989-1996

ASIA

YEAR	MALE	FEMALE	TOTAL	Visit time in days
1989	81	6	87	5745
1990	64	4	68	4138
1991	51	2	53	3052
1992	61	0	61	3916
1993	62	7	69	4822
1994	58	2	60	3805
1995	71	3	74	4416
1996	56	3	59	3557

Table 5: Numbers of associates from Asia visiting ICTP during 1989-1996

YEAR	FP	PCM	M	PE	PEV	PLS	AP	TOTAL
1989	68	66	34	11	16	10	6	211
1990	65	68	37	8	17	11	7	213
1991	62	62	43	8	17	12	16	220
1992	62	57	35	7	17	11	15	204
1993	56	50	35	7	18	11	14	191
1994	48	49	32	7	13	12	16	177
1995	53	47	37	7	14	15	20	193
1996	55	53	41	7	10	14	16	196

Table 6: Numbers of associates from Asia and their fields distribution for the period 1989-1996

YEAR	INT REP	ICTP PREP
1989	25	40
1990	8	19
1991	5	23
1992	12	23
1993	11	25
1994	3	26
1995	4	20
1996	0	8

Table 7: Numbers of ICTP Internal Reports and preprints produced by associates from Asia for the period 1989-1996

LATIN AMERICA

YEAR	MALE	FEMALE	TOTAL	Visit time in days
1989	18	1	19	1071
1990	26	5	31	1874
1991	24	4	28	1427
1992	14	3	17	813
1993	18	5	23	1060
1994	21	3	24	1145
1995	28	6	34	1583
1996	20	4	24	1078

Table 8: Numbers of associates from Latin America visiting ICTP during 1989-1996

YEAR	FP	PCM	M	PE	PEV	PLS	AP	TOTAL
1989	15	30	22	11	23	9	3	104
1990	18	30	21	14	22	11	3	116
1991	21	32	24	11	24	10	8	122
1992	20	25	22	11	26	9	7	119
1993	21	24	25	13	27	8	11	134
1994	23	20	26	11	25	9	16	140
1995	26	20	28	11	26	10	18	146
1996	25	21	34	9	22	11	13	138

Table 9: Numbers of associates from Latin America and their fields distribution for the period 1989-1996

YEAR	INT REP	ICTP PREP
1989	1	6
1990	5	3
1991	2	6
1992	1	5
1993	0	3
1994	2	5
1995	2	9
1996	0	2

Table 10: Numbers of ICTP Internal Reports and preprints produced by associates from Latin America for the period 1989-1996

OCEANIA

YEAR	MALE	FEMALE	TOTAL	Visit time in days
1989	0	0	0	0
1990	3	0	3	211
1991	0	0	0	0
1992	0	0	0	0
1993	1	0	1	53
1994	0	0	0	0
1995	0	0	0	0
1996	1	0	1	90

Table 11: Numbers of associates from Oceania visiting ICTP during 1989-1996

YEAR	FP	PCM	M	PE	PEV	PLS	AP	TOTAL
1989	1	1	1	0	3	0	0	6
1990	1	2	1	0	2	0	0	6
1991	1	1	1	0	1	0	0	4
1992	1	1	0	0	1	0	0	3
1993	1	1	0	0	0	0	0	2
1994	0	0	0	0	0	0	0	0
1995	0	1	0	0	0	0	0	1
1996	0	2	0	0	0	0	0	2

Table 12: Numbers of associates from Oceania and their fields distribution for the period 1989-1996

YEAR	INT REP	ICTP PREP
1989	0	0
1990	0	1
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0
1996	0	0

Table 13: Numbers of ICTP Internal Reports and preprints produced by associates from Oceania for the period 1989-1996

EUROPE

YEAR	MALE	FEMALE	TOTAL	Visit time in days
1989	8	3	11	561
1990	4	1	5	270
1991	3	1	4	159
1992	6	2	8	586
1993	10	0	10	467
1994	6	0	6	364
1995	19	2	21	1158
1996	19	3	22	1189

Table 14: Numbers of associates from Europe visiting ICTP during 1989-1996

YEAR	FP	PCM	M	PE	PEV	PLS	AP	TOTAL
1989	6	4	0	3	0	1	2	16
1990	8	3	1	3	1	0	2	18
1991	10	2	2	3	0	1	4	22
1992	15	3	2	4	2	2	4	32
1993	13	3	2	4	2	1	4	29
1994	13	4	2	3	4	2	4	32
1995	16	8	4	3	5	3	7	46
1996	16	9	7	2	5	3	6	48

Table 15: Numbers of associates from Europe and their fields distribution for the period 1989-1996

YEAR	INT REP	ICTP PREP
1989	0	4
1990	0	2
1991	0	0
1992	1	0
1993	1	1
1994	0	1
1995	0	5
1996	0	3

Table 16: Numbers of ICTP Internal Reports and preprints produced by associates from Europe for the period 1989-1996

Appendix 6. List of SAREC-supported associates 1993-96

Associate	Country	Field code	Birth year	Age	Subject	Amount aut 93 \$	Amount spr 94 \$	Amount 93/94 \$	Amount 94/95 \$	Amount 95/96 \$	Amount 93/94-95/96 \$
Alam	Bangladesh	PCM	51	45				0		0	0
Basak	Bangladesh	PHE		96	Nuclear Physics			0	3 198	0	3 198
Bashar	Bangladesh	PLS	47	49				0		0	0
Chowdhury	Bangladesh	PHE	51	45	High Energy Physics		3 238	3 238	4 990	3 991	12 219
Harun	Bangladesh	PHE				530		530			530
Hasan	Bangladesh	O	57	39				0		0	0
Hassan	Bangladesh	PCM	51	45	Condensed Matter Physics		1 255	1 255	2 142	0	3 397
Ibrahim	Bangladesh	PE		96	Non-conventional Energy			0		3 582	3 582
Islam A K M A	Bangladesh	PCM		96	Condensed Matter Physics			0	3 519	0	3 519
Islam G S	Bangladesh	PHE	42	54	High Energy Physics			0	2 322	491	2 813
Majumdar	Bangladesh	M	54	42				0		0	0
Muniruzzaman	Bangladesh	PEV	48	48	Geophysics	2 744		2 744		2 969	5 713
Quazi	Bangladesh	PCM	63	33				0		0	0
Rahman	Bangladesh	M		96	Mathematics	709		709	1 812	2 739	5 260
Rashid	Bangladesh	PCM	45	51		4 225		4 225		0	4 225
Salimullah	Bangladesh	PHE	49	47	Plasma Physics			0		2 969	2 969
Sharif	Bangladesh	PE	44	52	Non-conventional Energy	3 232		3 232	2 616	0	5 848
Tarafder	Bangladesh	AP	50	46				0		0	0
Awanou C N	Benin	PE	50	46	Non-conventional Energy			0		4 396	4 396
Ezin	Benin	M	44	52	Mathematics			0		5 443	5 443
Hontinfinde	Benin	PCM	58	38				0		0	0
Laogun	Benin	PLS	43	53	Biophysics			0	3 198	4 250	7 448
Tossa	Benin	PHE	59	37	Relativity			0	5 367	5 462	10 829
Mpawenayo	Burundi	PE	50	46	Non-conventional Energy			0		2 440	2 440
Nzohabonayo	Burundi	PCM	53	43	Atomic Physics		2 628	2 628		3 233	5 861
Rwitanaga	Burundi	O	59	37	Communication Physics			0	4 807	4 947	9 754
Desquith	Côte d'Ivoire	M	53	43	Mathematics	4 908		4 908		5 890	10 798
Diomande	Côte d'Ivoire	AP	59	37	Lasers			0	3 689	3 610	7 299
Logon	Côte d'Ivoire	M	55	41	Mathematics			0		5 986	5 986
Dikande	Cameroon	PCM	64	32				0		0	0
Kamgam	Cameroon	O	60	36				0		0	0
Wofo	Cameroon	PCM	65	31	Condensed Matter Physics			0		5 217	5 217
Woldu	Cameroon	PEV	51					0		0	0
Woufo-Kamga	Cameroon	M	40	56	Mathematics			0		3 393	3 393
Elion-Mboussa	Congo	PLS		96	Biophysics			0	6 543	0	6 543
Ghebrebrhan	Eritrea	PEV	42	54			2 485	2 485		0	2 485
Zedingle	Eritrea	M	52	44	Mathematics			0		4 462	4 462
Alamneh, F K	Ethiopia	PEV	56	40	Geophysics	745	336	1 081	5 024	1 582	7 687
Alemu	Ethiopia	M	50	46	Mathematics		1 580	1 580	3 231	1 623	6 433
Bantikassegn	Ethiopia	PEV	50	46			2 459	2 459		0	2 459
Kassahun	Ethiopia	AP	45	51	Lasers			0	485	3 230	3 715
Mammo	Ethiopia	PEV	52	44	Geophysics	390	336	726	4 465	3 189	8 380
Tsegaye	Ethiopia	AP	64	32	Lasers		2 543	2 543	3 860	3 802	10 205
Zewdie	Ethiopia	PCM				4 384		4 384			4 384
Adjepong	Ghana	PEV	44	52				0		0	0

Associate	Country	Field code	Birth year	Age	Subject	Amount aut 93 \$	Amount spr 94 \$	Amount 93/94 \$	Amount 94/95 \$	Amount 95/96 \$	Amount 93/94-95/96 \$
Andam A A B	Ghana	PHE		96	Nuclear Physics	3 156		3 156	2 263	0	5 419
Andam K A	Ghana	PLS		96	Microelectronics	3 083		3 083	2 545	1 676	7 304
Baeta	Ghana	PCM		96	Condensed Matter Physics	4 401		4 401		1 022	5 423
Baryeh	Ghana	PE	45	51	Non-conventional Energy			0	4 227	4 934	9 160
Buah-Bassuah	Ghana	PCM	52	44	Atomic Physics		4 098	4 098	4 444	0	8 542
Kyere	Ghana	PLS	47	49	Medical Physics			0	3 542	531	4 073
Mensah	Ghana	PCM		96	Condensed Matter Physics			0	4 718	5 418	10 137
Nkum	Ghana	PCM	54	42				0		0	0
Nsowah-Nuamah	Ghana	M	56	40				0		0	0
Oduro-Afriyie	Ghana	PEV	48	48	Climatology			0	2 858	8 069	10 927
Schandorf	Ghana	PLS	46	50	Medical Physics			0	4 067	0	4 067
Wiafe-Akenten	Ghana	PCM	43	53	Atomic Physics			0	5 024	4 931	9 955
Yakubu	Ghana	PE	55					0		0	0
Bah	Guinea	M	58	38				0		0	0
Barry	Guinea	PE				2 057		2 057			2 057
Diallo A T	Guinea	M	47	49	Mathematics			0		5 346	5 346
Maomy	Guinea	PE	50	46	Non-conventional Energy			0		7 462	7 462
Sy Savane	Guinea	PHE	55	41	Nuclear Physics			0		5 855	5 855
Aduda	Kenya	PCM		96	Condensed Matter Physics			0	5 241	5 189	10 429
Genga	Kenya	PHE	52	44	Plasma Physics			0		5 189	5 189
Kiptui	Kenya	O				4 116		4 116			4 116
Kola	Kenya	PCM	56	40	Condensed Matter Physics			0	5 086	3 569	8 656
Oyoko	Kenya	PCM	48	48				0		0	0
Rabah	Kenya	PCM	58	38	Condensed Matter Physics		2 287	2 287	7 192	0	9 479
Ishiekwene	Liberia	AP	59	37	Lasers		3 845	3 845	9 545	2 730	16 119
Rambolamanana	Madagascar	PEV	60	36	Geophysics			0		5 069	5 069
Ratsimbazafy	Madagascar	PEV	46	50	Geophysics		1 633	1 633	3 598	5 701	10 933
Diallo M A	Mali	PEV	57	39	Climatology			0	2 697	7 840	10 536
Toure	Mali	PEV	59	37	Climatology			0	4 515	0	4 515
Bahya	Mauritania	M	62	34				0		0	0
Cheikh	Mauritania	M	61	35	Mathematics			0	3 322	0	3 322
Haouba	Mauritania	M		96	Mathematics	3 141		3 141	2 224	2 330	7 696
Ould Jidoumou	Mauritania	M	63	33				0		3 918	3 918
Basnet	Nepal	PEV	54	42	Soil Physics		2 406	2 406		3 575	5 981
Bhattari	Nepal	M	44	52				0		0	0
Jha	Nepal	PHE	50	46	Plasma Physics			0	4 870	1 155	6 025
Maskey	Nepal	M	49	47	Mathematics			0		4 915	4 915
Shreshtha	Nepal	M				3 357		3 357			3 357
Subedi	Nepal	PEV	57	39	Geophysics	4 482		4 482	2 364	6 173	13 019
Thapa	Nepal	O		96	Communication Physics	3 343	1 907	5 250	2 278	0	7 528
Moussa	Niger	M	57	39	Mathematics			0	4 137	0	4 137
Adegboyega	Nigeria	PCM	48	48		3 701		3 701		0	3 701
Adeniyi	Nigeria	O	47	49	Communication Physics	2 969	3 291	6 260	2 626	6 148	15 034
Adibe	Nigeria	PEV	56	40				0		0	0
Ajayi G O	Nigeria	O	41	55	Communication Physics			0	1 492	5 063	6 555
Ajayi O	Nigeria	PEV	51	45		709		709		245	954
Ajewole	Nigeria	O	61	35	Communication Physics		3 991	3 991	7 496	0	11 487

Associate	Country	Field code	Birth year	Age	Subject	Amount aut 93 \$	Amount spr 94 \$	Amount 93/94 \$	Amount 94/95 \$	Amount 95/96 \$	Amount 93/94-95/96 \$
Akinlade	Nigeria	PCM	63	33				0		0	0
Akinola	Nigeria	M	55	41				0		0	0
Akinyele	Nigeria	M	44	52				0		0	0
Asuzu I U	Nigeria	PLS	53	43	Biophysics			0		5 428	5 428
Balogun	Nigeria	PLS	56	40	Medical Physics			0		5 208	5 208
Chendo	Nigeria	PE		96	Non-conventional Energy	2 849	2 919	5 768	317	2 289	8 374
Ekhaguere	Nigeria	M		96	Mathematics			0		5 189	5 189
Ekuwem	Nigeria	PEV		96	Climatology	4 161	327	4 488	6 984	1 758	13 230
Eze	Nigeria	PLS	43	53		4 222		4 222		0	4 222
Famurewa	Nigeria	PLS		96	Biophysics	3 636		3 636	3 110	1 438	8 184
Folorunso	Nigeria	PEV		96				0		0	0
Ibiyemi	Nigeria	PLS	54	42	Medical Physics	3 003		3 003		6 396	9 399
Iloeje	Nigeria	PE	45	51	Non-conventional Energy	2 764		2 764		5 267	8 031
Kolawole	Nigeria	PEV	42	54	Geophysics			0	3 682	5 226	8 908
Kuku	Nigeria	PE	52	44	Non-conventional Energy	2 693	3 485	6 178	558	5 104	11 840
Maliki	Nigeria	M	59	37				0		0	0
Mbagwu J S	Nigeria	PEV	49	47	Soil Physics	4 138	3 843	7 981	5 245	0	13 226
Mshelia	Nigeria	PHE		96	Nuclear Physics			336	336	2 800	3 136
Odundon	Nigeria	PHE	40	56	High Energy Physics	4 092		4 092		5 267	9 359
Olabanji	Nigeria	PLS	48	48	Medical Physics		4 425	4 425		3 239	7 664
Oli	Nigeria	PCM					2 729	2 729			2 729
Olowolafe	Nigeria	PCM	47	49				0		0	0
Onwuagba	Nigeria	PCM	48	48	Condensed Matter Physics			0	5 260	0	5 260
Saporu	Nigeria	M	49	47	Mathematics		421	421	4 777	6 126	11 324
Montenegro	Peru	O	51	45				0		0	0
Valverde	Peru	M	39	57	Mathematics			0	5 501	0	5 501
Vasquez	Peru	PEV			Geophysics			0		1 226	1 226
Ntagwirumugara	Rwanda	M				2 163		2 163			2 163
Ba	Senegal	PCM	53	43	Condensed Matter Physics	1 419		1 419	5 723	3 915	11 057
Beye	Senegal	PCM	52	44				0		0	0
Diop	Senegal	PCM	54	42				0		0	0
Fall	Senegal	O	52	44	Communication Physics			0		3 245	3 245
Gaye	Senegal	PHE	47	49	Plasma Physics			0	4 601	4 082	8 683
Sangare	Senegal	M	51	45				0		0	0
Wague	Senegal	PCM		96	Atomic Physics		647	647	297	0	944
Youm	Senegal	PE	54	42	Non-conventional Energy			0	5 143	4 509	9 652
Yormah	Sierra Leone	PEV		96	Soil Physics	4 251		4 251		6 365	10 616
Kandasamy	Sri Lanka	PCM	51	45				0		0	0
Kularatna	Sri Lanka	O	54	42				0		0	0
Kunaratnam	Sri Lanka	PEV				3 847		3 847			3 847
Samuel	Sri Lanka	PE		96	Non-conventional Energy	2 850		2 850	1 322	0	4 172
Sumathipala	Sri Lanka	PEV	47	49	Climatology			0	3 701	0	3 701
Tantrigoda	Sri Lanka	PEV		96	Geophysics			0	4 508	0	4 508
Abdalla	Sudan	PEV	57	39				0		0	0
Abdel-Rahman	Sudan	PHE	40	56	Relativity		1 690	1 690	1 949	777	4 416
Ahmed	Sudan	M	54	42				0		0	0
Dirar	Sudan	PHE	56	40	Relativity		1 477	1 477	3 438	6 991	11 907

Associate	Country	Field code	Birth year	Age	Subject	Amount aut 93 \$	Amount spr 94 \$	Amount 93/94 \$	Amount 94/95 \$	Amount 95/96 \$	Amount 93/94-95/96 \$
El-Mekki	Sudan	PEV		96	Geophysics		491	491	4 211	0	4 702
Habbani	Sudan	PHE	40	56	Nuclear Physics			0		2 701	2 701
Sanhour	Sudan	O		96	Communication Physics	2 674	1 820	4 494	3 700	0	8 194
Kajuni	Tanzania	PEV		96	Climatology			0	3 180	0	3 180
Kivaisi	Tanzania	PE	49	47				0		0	0
Kundaali	Tanzania	PCM	53	43				0		0	0
Mshimba	Tanzania	M	48	48				0		0	0
Nikundiwe	Tanzania	PLS	40	56				0		0	0
Nnko	Tanzania	PEV	51	45	Climatology		3 024	3 024	3 847	2 003	8 875
Edee	Togo	PLS						0		2 840	2 840
Mohou	Togo	AP	60	36	Lasers			0	4 247	5 387	9 634
Kaahwa	Uganda	PCM				3 784		3 784			3 784
Chuong Nguyen Minh	Vietnam	M						0		450	450
Duc Duong Minh	Vietnam	M	51	45	Mathematics	4 445		4 445	5 385	0	9 830
Duc Ngyen Huu	Vietnam	M	50	46	Mathematics			0	3 217	0	3 217
Fam	Vietnam	PCM	58	38				0		0	0
Ngo	Vietnam	M	53	43				0		0	0
Nguyen Ai Viet	Vietnam	PCM	51	45				0		0	0
Nguyen Ba An	Vietnam	PCM	50	46	Condensed Matter Physics			0		5 198	5 198
Nguyen Han Suan	Vietnam	PHE	48	48	High Energy Physics			0	4 887	2 226	7 113
Nguyen Hong Shon	Vietnam	PCM	56	40				0		0	0
Nguyen Ngoc Thuan	Vietnam	PCM		96	Condensed Matter Physics			0		5 563	5 563
Nguyen Thang Toan	Vietnam	PCM	51	45				0		0	0
Nguyen Trung Dan	Vietnam	PCM	63	33				0		0	0
Nhung Tran Van	Vietnam	PCM	48	48				0		0	0
Quang Doan Nhat	Vietnam	PCM	42	54	Condensed Matter Physics			0		5 481	5 481
Tran Huu Phat	Vietnam	PHE	41	55				0		-1 248	-1 248
Tran Thoai	Vietnam	PCM	46					0		0	0
Vu Ngoc Phat	Vietnam	M	52	44	Mathematics			0		5 252	5 252
Kahindo	Zaire	PEV	50	46	Climatology	5 817		5 817	6 801	6 947	19 565
Karemera	Zaire	PCM				5 807		5 807			5 807
Kazadi	Zaire	AP	54	42	Lasers			0	7 288	14 264	21 551
Lubuma	Zaire	M	54	42	Mathematics			0	5 168	6 858	12 027
Luhandjula	Zaire	M		96	Mathematics		5 326	5 326	6 642	6 928	18 896
Mbungu	Zaire	PCM		96	Condensed Matter Physics	6 251		6 251	9 876	0	16 127
Mudogo	Zaire	PLS	56	40	Biophysics			0		2 453	2 453
Ramadhani	Zaire	M	59	37	Mathematics			0	5 860	5 903	11 762
Walo Omana	Zaire	M	51	45	Mathematics			0	6 641	6 827	13 468
Jain	Zambia	PE						0		327	327
Carelse	Zimbabwe	PLS	43	53	Biophysics			0		4 723	4 723
Mujaji	Zimbabwe	PCM	62	34				0		0	0
Mutangadura	Zimbabwe	M		96	Mathematics			0	3 108	0	3 108
Summa								208 526	316 617	383 073	908 216

Appendix 7. Data on the external activities

Affiliated centres (ICAC)

There are 20 ICACs organised by the OEA, with 9 in Africa, 2 in the Middle East, 3 in Asia, 4 in the Far East, and 2 in Latin America as shown in the tables below.

COUNTRY	NAME OF ICAC	YEAR STARTED	FIELD
Benin	Institut de Mathématiques et des Sciences Physiques (IMSP)	1988	Mathematics Theoretical Physics
Ethiopia	Department of Physics Addis Ababa University	1995	Experimental and Theoretical Physics
Ivory Coast	Institut de Recherches Mathématiques (IRMA)	1989	Mathematics Education
Ghana	Laser and Fibre Optics Centre (LAFOC) Department of Physics University of Cape Coast	1992	Laser and Fibre Optics
Morocco	Laboratoire de Physique Theorique (LPT) University Mohamed V, Rabat	1989	Theoretical Physics
Senegal	Department of Physics University Cheikh Anta Diop	1992	Laser and Atomic Physics
Sudan	Department of Physics University of Khartoum	1989	Experimental and Theoretical Physics
Tanzania	International Village of Science and Technology (IVST)	1989	
Zimbabwe	Centre for Computers in Science Education (CISE) University of Zimbabwe	1993	Computer Science Education

Table 1: ICACs in Africa

COUNTRY	NAME OF ICAC	YEAR STARTED	FIELD
Jordan	Department of Physics Yarmouk University	1989	Computational Condensed Matter Physics
	Trekye University	1994	

Table 2: ICACs in the Middle East

COUNTRY	NAME OF ICAC	YEAR STARTED	FIELD
Bangladesh	Research Centre for Mathematical and Physical Sciences (RPCMS) University of Chittagong	1989	Theoretical Physics
India	Crystal Growth Centre, Madras	1994	Condensed Matter Physics
Pakistan	Department of Physics Quaid-i-Azam University	1989	Plasma, Atomic and Molecular, High Energy and Semiconductor Physics

Table 3: ICACs in Asia

COUNTRY	NAME OF ICAC	YEAR STARTED	FIELD
China	Institute of Geology and Geophysics in Earth's Interior, Chengdu	1992	Earth Sciences
Malaysia	Department of Physics University of Malaya	1989	Laser-Plasma Interactions
Thailand	Forum for Theoretical Science (FTS) Chulalongkorn University Bangkok	1989	Theoretical Physics, Theoretical Chemistry
Vietnam	Institute of Materials Science (IMS) of the National Centre for Science and Technology (NCST)	1996	Semiconductors, Superconductors, Laser spectroscopy, Materials Science

Table 4: ICACs in Far East

COUNTRY	NAME OF ICAC	YEAR STARTED	FIELD
Brazil	International Centre of Condensed Matter Physics (ICPCM)	1991	Condensed Matter Physics
Mexico	Centro de Investigacion en Matematicas (CIMAT)	1991	Mathematics

Table 5: ICACs in Latin America

Networks

There are 18 Networks organised by the OEA, with 5 in Africa, 1 in the Middle East, 4 in Asia, 1 in the Far East, and 7 in Latin America as shown in the tables below.

NAME OF NETWORK	YEAR STARTED	FIELD
Asian African Association for Plasma Training (AAAPT)	1989	Plasma interactions
Bi-regional Network on Telecommunications	1990	Radio propagation
African Network on Lasers, Atoms and Molecules (LAM)	1995	Optics, Lasers, Optical Fibres
Mathematical Sciences Network for Africa	1993	Mathematics
ICTP-IPPS-Lund Institute of Technology Cooperation Programme towards ICACs in Africa	1996	

Table 6: Networks in Africa

NAME OF NETWORK	YEAR STARTED	FIELD
Asian African Association for Plasma Training (AAAPT)	1989	Plasma Interactions

Table 7: Network in the Middle East

NAME OF NETWORK	YEAR STARTED	FIELD
BCSPIN	1989	Theoretical Physics
Asian African Association for Plasma Training (AAAPT)	1989	Plasma Interactions
Regional Network for Semiconductor Science and Technology	1990	Semiconductor Science
Network on Metals and Alloys	1993	Materials Science

Table 8: Networks in Asia

NAME OF NETWORK	YEAR STARTED	FIELD
Regional Network on Mathematical Physics and Theoretical Computer Science	1995	Theoretical Physics

Table 9: Network in Far East

NAME OF NETWORK	YEAR STARTED	FIELD
Argentine-ICTP Scientific Cooperation Programme	1987	Materials Science
Mathematics Project for Scientific Development	1989	Mathematics
Bi-regional Network on Telecommunications	1990	Radio propagation
Network on Representation Theory	1993	Mathematics
Interdisciplinary Regional Network on Materials Science	1994	Materials Science
Network among Peru, Mexico, Chile on Thin Films	1995	Thin films
Multipurpose Optics Network (MON)	1996	Multipurpose optics

Table 10: Networks in Latin America

Scientific meetings

The OEA offers assistance in support of international and regional scientific meetings in the developing countries in the fields of physics and pure and applied mathematics. Normally, the ICTP grant does not exceed the amount of US \$ 5000 and the ICTP contribution should be matched by local funds.

Over the period 1989-1996, 629 scientific meetings have been held with the support of the OEA, with 116 in Africa, 65 in the Middle East, 142 in Asia, 105 in the Far East, and 201 in Latin America as shown in the tables below.

Year	PHE	PCM	M	PE	PEV	PLS	AP	EDU	MIS	Total
1989	1	0	5	1	5	1	5	9	2	29
1990	0	0	0	0	0	0	0	2	1	3
1991	1	0	4	1	5	0	4	7	2	24
1992	0	0	3	0	1	0	1	2	0	7
1993	1	0	5	2	2	0	5	1	0	16
1994	0	0	5	1	0	0	2	0	0	8
1995	0	1	8	1	1	0	3	2	1	17
1996	3	0	5	0	1	0	1	1	1	12
Total	6	1	35	6	15	1	21	24	7	116

Table 11. Scientific meetings distributed over scientific fields held in Africa during 1989-1996 with support from the Office of External Activities. For code explanations see appendix 5.

Venue	Meeting	Dates	Amount US \$
Porto Novo, Benin	Autour des opérateurs de Dirac		2000
Gaborone, Botswana	SAMSA Conference on the environment in the SADCC region		5000
Nairobi, Kenya	Fourth Workshop on the applicability of environmental physics and meteorology in Africa		3500
Nairobi, Kenya	Second WMO/ICTP International Workshop on tropical limited area modelling	30 August to 3 Sept 1993	5000
Lesotho	International Workshop on geometry, analysis and algebra		3500
Ibadan, Nigeria	Symposium on current trends in research in mathematics, computer science and mathematical physics	17 to 21 January 1994	5000
Dakar, Senegal	African Mathematical Union Fourth Pan-African mathematics olympiad		5000
Dakar, Senegal	AFRISTECH		3000
Harare, Zimbabwe	Second International workshop on the physics and modern application of lasers	6 to 14 September 1993	25000
Yaounde, Cameroon	Seminar GIRAGA V		5000
Cape Coast, Ghana	Third International Workshop on the physics and modern application of lasers	8 to 20 August 1994	5000
Kumasi, Ghana	Third Kumasi College on energy		2500
Nairobi, Kenya	Seventh International workshop on the use of microcomputers in science and mathematics education	2 to 9 July 1995	12500
Bulawayo, Zimbabwe	International workshop on physics and applications of thin films		3000
Porto Novo, Benin	Méthodes de resolution des equations aux dérivées partielles de la physique et de la géométrie	20 to 25 November 1995	5000
Porto Novo, Benin	Conference on geometric analysis and quantum field theory	10 to 12 December 1996	3000
Porto Novo, Benin	6 ^{ème} séminaire GIRAGA	13 December 1996	10000
Abidjan, Cote d'Ivoire	Symposium on mathematics	17 to 21 July 1995	3000
Abidjan, Cote d'Ivoire	Optical training school for teachers	2 to 14 September 1996	13000
Accra, Ghana	College on functional analysis and its applications to partial differential equations	10 to 17 July 1995	3000
Legon, Ghana	E A Bouchet regional college on functional analysis and its applications to differential equations	22 July to 2 August 1996	5000
Ifrane, Morocco	4th African Mathematical Union Pan-African congress of mathematicians	18 to 26 September 1995	10000
Ifrane, Morocco	6th African Mathematical Union Pan-African mathematical Olympiad	18 to 23 September 1995	4000
Dakar, Senegal	AFRIATECH 95 - Biennale des Sciences et Technologies	11 to 16 December 1995	3000
Khartoum, Sudan	Fourth International Workshop on the physics and modern application of lasers	6 to 14 January 1996	20000
Kampala, Uganda	7th African Mathematical Union Pan-African mathematical Olympiad	29 July to 3 August 1996	3400
Kinshasa, Zaire	Conference on variational problems in applied mathematics	21 to 26 August 1995	5000
Kinshasa, Zaire	Premières journées mathématiques de Kinshasa	22 to 27 July 1996	5000

Table 12: Scientific meetings in Africa supported by ICTP 1993/94-95/96.

Visiting Scholars/Consultants

The OEA offers assistance in support of Visiting Scholars/Consultants in the developing countries in the fields of physics and pure and applied mathematics.

Over the period during 1989-1996, 81 Visiting Scholars/Consultants have been deployed with the support of the OEA, with 20 in Africa, 4 in the Middle East, 22 in Asia, 13 in the Far East, and 22 in Latin America as shown in the tables below.

YEAR	AFRICA	MID EAST	ASIA	FAR EAST	LAT AM	TOTAL
1989	1	0	3	2	3	9
1990	0	0	0	0	0	0
1991	7	2	6	1	9	25
1992	1	0	1	2	1	6
1993	4	1	1	2	0	8
1994	1	0	2	2	5	10
1995	5	1	6	4	3	19
1996	1	0	3	0	1	5
TOTAL	20	4	22	13	22	81

Table 13: The numbers of Visiting Scholars/Consultants on the OEA Programmes during 1989-1996.

Expenditures

The are two major sources of funding for the Office of External Activities: ICTP and SAREC. The amounts of funds spent on the OEA during 1989-1996 are shown in Table .

YEAR	AFRICA	MID EAST	ASIA	FAR EAST	LAT AM	TOTAL
1989	466 700	90 500	250 400	194 120	409 900	1 411 620
1990	185 000	18 500	133 000	110 500	124 100	571 100
1991	328 500	56 500	217 708	102 300	235 800	940 808
1992	186 000	23 000	134 600	99 500	124 000	567 100
1993	276 350	44 500	105 800	79 850	76 400	582 900
1994	217 100	21 000	117 500	47 500	122 400	525 500
1995	313 590	44 800	87 950	89 450	135 600	671 390
1996	225 400	33 000	98 105	74 500	101 600	532 605
TOTAL	2 198 640	331 800	1 145 063	797 720	1 329 800	5 803 023

Table 14: The amounts of funds (in US \$) spent on the OEA Programmes during 1989-1996. SAREC only funds the OEA programmes in Africa.

Appendix 8. Questionnaire to associates

EVALUATION OF SIDA-SAREC SUPPORT TO ICTP ASSOCIATE MEMBERSHIP SCHEME

1. PERSONAL PARTICULARS OF THE ASSOCIATE MEMBER

- 1.1 NAME
- 1.2 DATE OF BIRTH
- 1.3 GENDER
- 1.4 NATIONALITY
- 1.5 EDUCATIONAL QUALIFICATIONS (Degree/University/Year/Subject)

Degree	University	Years attended	Subject

1.6 ASSOCIATESHIP MEMBERSHIP SCHEME

Date of joining Associate scheme

Period of current visit at ICTP From to

1.7 RANK IN YOUR INSTITUTION

1.8 INSTITUTION

1.9 ADDRESS

- 1.10 TELEPHONE FAX
- E-MAIL TELEX

2 HUMAN RESOURCES

- 2.1 How many academic staff are there in your department?
- 2.2 How many technical staff are there in your department?
- 2.3 How many Associate Members are there in your department?

3 FINANCIAL RESOURCES

- 3.1 What are the sources of grants for researchers in your institution?
- 3.2 List recent research grants you have obtained

SOURCE OF RESEARCH FUNDING	AMOUNT (US \$)	PERIOD

- 3.3 What are the sources of funding for graduate studies in your institution?

4 PHYSICAL RESOURCES

4.1 LABORATORY SPACE/RESEARCH EQUIPMENT

- 4.1.1 Comment on the status of laboratory space in your institution
- 4.1.2 List of major equipment
- 4.1.3 How was the equipment procured?
- 4.1.4 Comment on the installation of the equipment
- 4.1.5 Comment on the maintenance and repair of the equipment
- 4.1.6 Comment on the availability of spare parts
- 4.1.7 Comment on the use of equipment

4.2 LIBRARY FACILITIES

- Availability of journals
- Availability of books
- Availability of other information resources

5 TEACHING

- 5.1 Does your department run any of the following graduate programmes?
 - MSc
 - MPhil
 - PhD
- 5.2 What is the average balance between teaching and research in your university?

6 RESEARCH

6.1 RESEARCH AREA

Please tick the research area you are working in from the following broadly defined groups

RESEARCH AREA	PLEASE TICK
High and Intermediate Energies	
Condensed Matter Physics	
Mathematics	
Physics and Energy	
Physics and Environment	
Physics and the Living State	
Applied Physics	
Physics and Mathematics Education	
Others	

6.2 RESEARCH TOPICS

Kindly specify below your main research topics

6.3 RESEARCH GROUP/RESEARCH GROUP LEADER/MEMBERS

- Does your research involve working in a group? Yes/No
- If yes, give the name of the group leader .

and RESEARCH GROUP MEMBERS

6.4 RESEARCH OUTPUT/PUBLICATIONS (1989 - 1996) (Please attach your list of publications according to)

International journals

National journals

Conference papers

Reports/Working papers

6.5 RESEARCH SUSTAINABILITY

Is your research programme sustainable in the long run? Please explain briefly.

7 SERVICE AND CONSULTANCY

What type of professional service, if any, does your research provide?

What type of consultancy, if any, does your research provide?

8 SEMINARS/CONFERENCES/WORKSHOPS

8.1 How many seminars/conferences/seminars have been organised by your department during 1989 - 1996?

9 NETWORKING/COOPERATING PARTNERS

NORTH - SOUTH

SOUTH - SOUTH

10 ICTP ACTIVITIES

10.1 ICTP FACILITIES

Which facilities did you find most useful to your research work at ICTP?

10.2 OFFICE OF EXTERNAL ACTIVITIES

The OEA at ICTP organises the following activities. Please state whether your institution has been involved in these activities.

ICTP Affiliated Centres (Yes/No)

Networks (Yes/No)

Scientific Meetings (Yes/No)

Visiting Scholars/Consultants (Yes/No)

10.3 ICTP OFFICIALS

Has an ICTP official visited your institution? Who? When?

10.4 GENERAL

Comment on the impact of ICTP on the research activities of your department

Appendix 9. Questionnaire to affiliated centres

EVALUATION OF SIDA SUPPORT TO ICTP - AUGUST 1996

1. PARTICULARS OF THE AFFILIATED CENTRE

1.1 NAME OF INSTITUTION

1.2 DATE OF AFFILIATION

1.3 HEAD OF DEPARTMENT

COORDINATOR OF ICAC

1.4 ADDRESS

1.5 TELEPHONE

FAX

E-MAIL

TELEX

2. RESEARCH PARTICULARS

2.1 HUMAN RESOURCES

2.1.1 ACADEMIC STAFF LIST (Please complete, as below, on a separate sheet and attach)

NAME TITLE QUALIFICATIONS GENDER

2.1.2 TECHNICAL STAFF (Please complete, as below, on a separate sheet and attach)

NAME TITLE QUALIFICATIONS GENDER

2.1.3 ICTP ASSOCIATE MEMBERS

How many ICTP Associate Members are there in your institution?

NAME	GENDER	FIELD	PERIOD

2.2 FINANCIAL RESOURCES

2.2.1 SOURCES OF RESEARCH FUNDING

SOURCE OF RESEARCH FUNDING	AMOUNT (US)	PERIOD
ICTP		
LOCAL (Research contribution only)		
OTHER		

2.2.2 SCHOLARSHIPS FOR GRADUATE STUDIES

2.2.2.1 Average cost for training a graduate student

MSc

MPhil

PhD

2.2.2.2 What are the sources of funding for graduate studies?

2.2.3 GRANTS FOR RESEARCHERS

2.2.3.1 List recent research grants for researchers

2.2.3.2 What are the sources of grants for researchers?

2.2.4 AUDITING

What are the methods for auditing of research grants?

2.3 PHYSICAL RESOURCES

IF THERE IS MORE THAN ONE RESEARCH GROUP, SECTION 2.3 SHOULD BE COMPLETED SEPARATELY FOR EACH GROUP

2.3.1 LABORATORY SPACE

2.3.2 RESEARCH EQUIPMENT/INSTRUMENTS AVAILABLE

2.3.2.1 List of major equipment

2.3.2.2 How was the equipment procured?

2.3.2.3 Comment on the installation of the equipment

2.3.2.4 Comment on the maintenance and repair of the equipment

2.3.2.5 Comment on the availability of spare parts

2.3.2.6 Comment on the use of equipment

2.3.3 LIBRARY FACILITIES

Availability of journals

Availability of books

Availability of other information resources

2.3.4 COMMUNICATION FACILITIES

Comment on the efficiency of the following communication facilities

Telephone

Fax

Telex

Email

Internet

2.4 TEACHING AND RESEARCH PROGRAMMES

2.4.1 TEACHING

2.4.1.1 UNDERGRADUATE PROGRAMMES

YEAR	QUALIFICATION	MALE	FEMALE	TOTAL
1992				
1993				
1994				
1995				
1996				

2.4.1.2 POST GRADUATE PROGRAMMES

MSc

YEAR	QUALIFICATON	MALE	FEMALE	TOTAL
1992				
1993				
1994				
1995				
1996				

MPhil/PhD

YEAR	QUALIFICATON	MALE	FEMALE	TOTAL
1992				
1993				
1994				
1995				
1996				

2.4.2 RESEARCH

IF THERE IS MORE THAN ONE RESEARCH GROUP, SECTIONS 2.4.2 SHOULD BE COMPLETED SEPARATELY FOR EACH GROUP

2.4.2.1 RESEARCH GROUP

2.4.2.2 RESEARCH TOPICS

2.4.2.3 RESEARCH GROUP LEADER

2.4.2.4 RESEARCH GROUP MEMBERS

2.4.2.5 RESEARCH OUTPUT/PUBLICATIONS (1989 - 1996) (your list should separate the publications according to

International journals

National journals

Conference papers

Reports/Working papers

2.4.2.6 HOW MANY SEMINARS/CONFERENCES/WORKSHOPS HAVE BEEN ORGANISED BY YOUR DEPARTMENT DURING 1989 - 1996?

2.4.2.7 NETWORKING/COOPERATING PARTNERS

NORTH - SOUTH

SOUTH - SOUTH

2.4.2.8 OTHER ISSUES

Is there research cooperation between your department with other departments in your university? Explain briefly.

Is your research programme sustainable in the long run?

What is the average balance between teaching and research in your university?

2.4.3 SERVICE AND CONSULTANCY

What type of professional service, if any, does your research provide?

What type of consultancy, if any, does your research provide?

2.5 ICTP AND YOUR DEPARTMENT

2.5.1 REPORTING

How do you report to ICTP? Procedure? Frequency?

2.5.2 ICTP ASSOCIATE MEMBERS

List recent visits to the ICTP by Associate Members in your centre. Who? When? How long?

2.5.3 ICTP OFFICIALS

Has an ICTP official visited your centre? Who? When?

2.5.4 GENERAL

Comment on the impact of ICTP on the research activities of your department

Sida Evaluations - 1996/97

- 96/40 Curriculum Development in Ethiopia, A Consultancy Study for the Ministry of Education in Ethiopia and for Sida. Mikael Palme, Wiggo Kilborn, Christopher Stroud, Oleg Popov
Department for Democracy and Social Development
- 96/41 Sida Support to Environmental Public Awareness and Training Projects through The Panos Institute, Gemini News Service and Television Trust for the Environment. Leo Kenny, Alice Petren
Department for Democracy and Social Development
- 96/42 Concessionary Credits in Support of Economic Development in Zimbabwe. Karlis Goppers
Department for Infrastructure and Economic Cooperation
- 96/43 Botswana Road Safety Improvement Projects. Rob Davey
Department for Infrastructure and Economic Cooperation
- 96/44 Programa de Estudo Pos Graduacao - PEP Guinea Bissau 1992-1996. Roy Carr Hill, Ahmed Dawalbeit
Department for Democracy and Social Development
- 96/45 Capacity Building and Networking, A meta-evaluation of African regional research networks. Jerker Carlsson, Lennart Wolgemuth
Department for Evaluation and Internal Audit
- 96/46 Support to the Maritime Sector in Lithuania. Nils Bruzelius
Department for Central and Eastern Europe
- 96/47 Local Development Programme in Nicaragua, PRODEL. Irene Vance, Jorge Vargas
Department for Infrastructure and Economic Development
- 96/48 The Planta Nicaragua Rehabilitation Programme. Consulting Services. Judith Muller, Per-Johan Svenningsson
Department for Infrastructure and Economic Development
- 96/49 Sida Support to the International Institute for Educational Planning, IIEP. Peter Williams, Lees Maxey
Department for Democracy and Social Development
- 96/50 The Human Factor. Cooperation in Public Administration between Sweden and Mongolia. Lennart Peck, Marianne Hultberg
Department for Infrastructure and Economic Cooperation
- 97/1 Swedish Consultancy Trust Funds with the African Development Bank. Karlis Goppers, Sven Öhlund
Department for Infrastructure and Economic Cooperation
- 97/2 Programa de Vivienda Social de FUPROVI, Costa Rica. Lillemor Andersson-Brolin, Bauricio Silva
Department for Infrastructure and Economic Cooperation
- 97/3 Sida's Assistance to the Environment Protection Training and Research Institute, EPTRI, India. Bo Lundberg, Bo Carlsson, K P Nyati
Department for Natural Resources and the Environment
- 97/4 Environment & Land Management Sector Activities, ELMS 1991-1995, Southern African Development Community, SADC
Department for Natural Resources and the Environment
- 97/5 Labour Construction Unit, LCU - Lesotho, 1997-1996. David Stiedl
Department for Infrastructure and Economic Cooperation

- 97/6 Sida's Support to the Start East Programme. Cecilia Karlstedt, Sven Hilding, Piotr Gryko
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- 97/7 Sida's Cultural Support to Namibia, 1991-1996. Dorian Haarhoff
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